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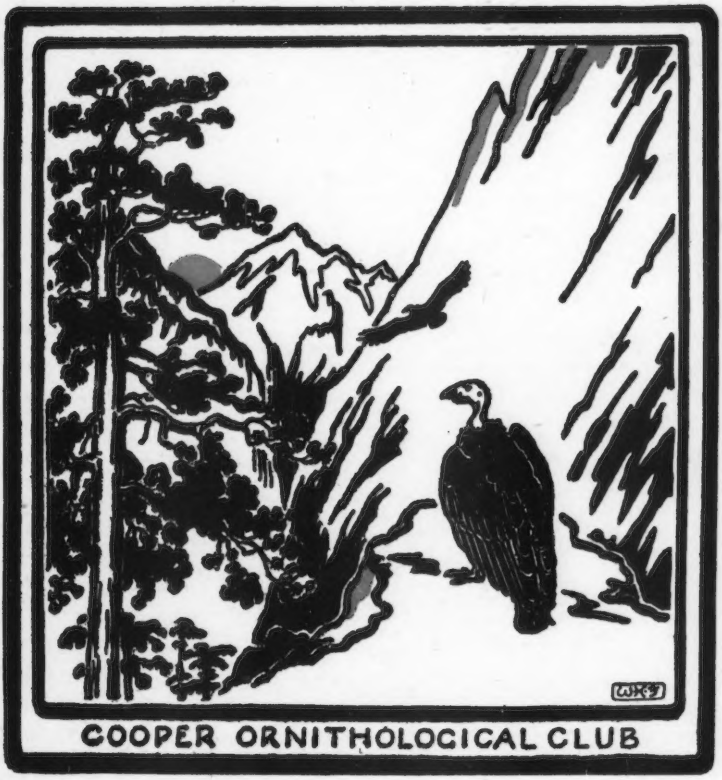
THE CONDOR

A Magazine of Western Ornithology

Volume XXXIV September-October, 1932 Number 5



COOPER ORNITHOLOGICAL CLUB

THE CONDOR

A Magazine of Western Ornithology

Published Bi-monthly by the Cooper Ornithological Club

Entered as second-class matter May 15, 1925, at the post-office at Berkeley, California, under Act of Congress of February 28, 1925, Section 412, paragraph 4.

Issued from the Office of THE CONDOR, Museum of Vertebrate Zoology, Berkeley, California.

SUBSCRIPTION RATES

Three Dollars per Year in the United States, payable in advance.

Fifty Cents the single copy.

Three Dollars and Twenty-five Cents per Year in all other countries in the International Postal Union.

COOPER ORNITHOLOGICAL CLUB

Dues are payable in advance on January first for the calendar year: Three Dollars per year for members residing in the United States; Three Dollars and Twenty-five Cents in all other countries. Members whose dues are paid receive THE CONDOR without additional charge.

The Life Membership fee is Seventy-five Dollars. No additional dues are required, and the money is invested and the interest only is used for Club publications. Life Members receive The Condor without additional charge.

Send manuscripts for publication to the Editor, J. GRINNELL, Museum of Vertebrate Zoology, University of California, Berkeley, or to either of the Associate Editors, JEAN M. LINSDALE and ALDEN H. MILLER, same address.

Send dues and subscriptions to JOHN McB. ROBERTSON, Associate Business Manager, Buena Park, California; orders for back numbers of THE CONDOR and the PACIFIC COAST AVIFAUNA series to W. LEE CHAMBERS, Business Manager, 2068 Escarpa Drive, Eagle Rock, California.

Issued September, 15, 1932

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SOME INFERENCES FROM SEVEN YEARS' BANDING RECORDS

By HAROLD MICHENER and JOSEPHINE R. MICHENER

Our banding station is the 100 by 317 foot lot upon which we live at 418 North Hudson Avenue (previously 418 Elm Avenue), Pasadena, California, within one-half mile of the main business street of that city. When banding was begun in the fall of 1924, the front, to a depth of 165 feet, was occupied by the house, twenty fruit and shade trees of moderate size, a considerable profusion of shrubs from three to five years old and a small lawn in front of the house entirely surrounded by shrubbery and the house. Back of this was a chicken yard about forty feet deep extending approximately the full width of the lot and in which two large eucalyptus trees grew. The next 65 feet of depth was open ground except for vegetables during part of the year; and the rear 55 feet was occupied by fourteen three-year-old fruit trees.

By the end of 1931 the shrubbery on the front half of the lot had grown in thickness and height until parts of it formed an almost impenetrable tangle ten to fifteen feet high, with paths and small open places here and there through it. Shrubbery had also extended along both sides and the back of the rear half of the lot and occupied most of the ground which had been used for vegetables in 1924. Soon after banding was begun we started the practice of disposing of the leaves from the street and pathways by profusely distributing them on the ground beneath the shrubbery, thus, in the course of one or two years, providing a bed of leaves and leaf mold several inches deep.

This change in the station grounds has been described in some detail because of the effect it has had on the bird population. This is most strikingly illustrated by the San Diego Spotted Towhee (*Pipilo maculatus megalonyx*).

During the six years' residence at this address previous to starting banding, we would occasionally see a San Diego Towhee and would think of it each time as the same individual or as a member of a small group that lived in our neighborhood. Then when we began to band we were surprised to find that we seldom caught the same bird twice. During the first year 27 were banded and only 4 of those repeated soon after banding, and two others returned about four months after banding. Four of those banded were immature. Although there were 27 banded and a total number of captures of 37 made from January to early October, these birds were rather uncommonly seen about the yard. They were apparently just drifting through. The next year (1926) their performance was of much the same character: 17 banded, 2

returns from the previous year, 3 individuals repeated a total of 6 times, and 5 of those banded were immature.

In 1927, the number of individuals trapped remained low, 19, of which 3 were returns from the previous year. Unlike the previous year, 15 of these repeated a total of 67 times and 13 of them were immature, one being recorded as recently out of the nest. The records of this year extend from January 17 to September 27, and immature birds were banded from May 31 to September 4. It seems evident that there were nests on or near our station grounds, but no nests or nesting activities were observed, probably because of lack of time for such observations.

If our banding records had only stopped with the year 1927 they would have shown conclusively what we knew to be taking place, namely, that the San Diego Towhee had become a resident of our yard in the sense that some of them were present much of the time and that they nested in or near the yard. Presumably this was because of the increase in the shrubbery and of the dead leaves on the ground in which to scratch. There was no doubt in our minds that this change was taking place and that these birds were making themselves more at home in our yard year after year. We first observed nest building activities in 1928 and have known that they had nests in the yard each year since then. We expected an analysis of our trapping records to show this change. This the records do show but not without disappointment to our expectations.

The analysis shown in table 1 gives the actual figures for the seven years. If one chooses the total number of individuals trapped each year as showing the relative abundance of these birds during the seven year period, the figures are 27, 19, 19, 24, 39, 42, and 38. It might be thought that the total number of captures (this includes repeats), would be a better measure of abundance. Then the figures are 37, 25, 86, 47, 64, 131, and 64. But why the high peaks in 1927 and 1930? These are due to the unusually large number of repeats for those two years. It might seem reasonable to think that the large number of repeats would result from a large number of immature birds; but this is not the case for the numbers of immature birds banded run 4, 5, 13, 13, 21, 25 and 20; no peak in 1927 and only a slight one in 1930. Another set of figures that might throw some light on the annual abundance of this species is the number of days in each year on which these birds were trapped. These figures are 32, 23, 50, 40, 52, 87 and 50, although the traps were open practically all of the time.

TABLE 1. ANALYSIS OF TRAPPING RECORDS OF SAN DIEGO TOWHEES

	1925	1926	1927	1928	1929	1930	1931	Totals
Individuals banded	27	17	16	21	34	36	33	184
Returns from previous years	....	2	3	3	5	6	5	24
Total individuals trapped	27	19	19	24	39	42	38	208
Repeat captures	10	6	67	23	25	89	26	246
Total captures	37	25	86	47	64	131	64	454
Individuals that repeated	4	3	14	5	12	22	8	68
Adult males banded	14	1	0	1	6	5	8	35
Adult females banded	9	8	2	6	7	6	4	42
Immature birds banded	4	5	13	13	21	25	20	101
Age and sex not recorded banded	0	3	1	1	0	0	1	6
Days on which captured	32	23	50	40	52	87	50	....

None of these rows of figures show the increases in population that we expected them to show. We are willing to say that during the last four years a San Diego Towhee could have been found on or near our lot nearly any day of the year and now that we are ready to admit that the trapping records do not closely approximate the relative abundance of this species, as measured by the annual summation of the num-

ber of individuals present each day, we will try to point out some of the reasons why this should be so. The factor of perhaps the greatest influence is the intelligence of the bird. Those that live here with us learn to go in and out of some types of traps as they please. They also learn to gather the food that other birds have knocked outside of the traps. It seems probable that the transients which visited us in the earlier years did not develop this wariness about the traps. Our experience with Fox Sparrows verifies this conclusion that the trapping records reflect quite closely the visits of transient birds of this general type. We have banded only 16 of them during the seven years in question. Nearly all of them have been seen first in the traps. A few have been seen before they were trapped, but never has one been seen without there being one in a trap shortly afterward.

Perhaps the appropriation of territory by a nesting pair has diverted transient San Diego Towhees from our traps during the nesting seasons of the later years.

Then there are numerous other causes that might have affected the trapping records one year more than another. Such things as building activities in neighboring yards, our own activities in the yard, cats, conditions that affect the continuity of our trapping operations, the condition of the traps themselves and many other things are variables that have not been closely controlled nor carefully recorded.

On taking a broad view of the records by averaging the results of several years, thus smoothing out the irregularities due to the causes mentioned above, we find that a comparison of the average of the last three years with the average of the first three years gives an increase in the number of birds banded of 70%; in the number of individuals trapped, 82%; in the total number of captures, 75%; in the number of individuals that repeated, 100%; in the number of immature birds banded, 200%; and in the number of days in the year on which these towhees were caught in our traps, 80%. These figures do, in a large measure, show the increased abundance of this species due to improved ecological conditions.

Now as to the orioles: The abundance of the orioles apparently has not been changed appreciably by the changes in our yard.

The Bullock Orioles (*Icterus bullockii*) have not been sufficiently numerous to justify much comment. Beginning with 1927 the annual catch has been 1, 9, 5, 3, and 3. Classified by sex and age they were 2 adult males, 1 one-year-old male, 4 females, 13 immature birds, and 1 with age and sex not recorded.

The Arizona Hooded Orioles (*Icterus cucullatus nelsoni*) have been more plentiful. Table 2 gives an analysis of the trapping records of the 205 banded during

TABLE 2. ANALYSIS OF TRAPPING RECORDS OF ARIZONA HOODED ORIOLES

	1925	1926	1927	1928	1929	1930	1931	Totals
Individuals banded	4	20	57	46	16	51	11	205
Returns from previous years	..	1	1	2	1	2	0	7
Total individuals trapped	4	21	58	48	17	53	11	212
Repeat captures	0	2	10	14	0	3	0	29
Total captures	4	23	68	62	17	56	11	241
Individuals that repeated	0	2	8	9	0	3	0	22
Adult males banded	0	2	4	3	3	4	0	16
Adult females banded	2	7	7	7	3	8	3	37
One-year-old males banded	0	0	5	2	2	5	6	20
Immature birds banded	2	12	42	33	9	32	21	151
Age and sex not recorded banded	0	0	0	3	0	4	0	7
Days on which captured	4	20	48	39	15	35	9	....

these seven years. The annual average of the number of individuals trapped during the first three years is within one of the same as that for the last three years. However, the ease of observing these birds has increased with the size and number of

abutilon (flowering maple) bushes. These give an abundance of flowers attractive to the orioles. The records show that about half as many adult males as females were trapped (16 to 37) and almost four times as many immatures as females (137 to 37). We know no reason for fewer males than females coming to our traps, but the ratio of immatures to females seems a reasonable ratio of the immature to female populations.

Perhaps the most interesting information our records show in regard to this bird is the time of year it may be expected in Pasadena and vicinity. In general our occurrence records lie between late March and the first part of September, as given by Willett (Birds of the Pacific Slope of Southern California, Pacific Coast Avifauna No. 7, 1912, p. 71); but we have a sufficient number of records of trapped birds and observed birds to lead to the conclusion that the Arizona Hooded Oriole may be expected here any month of the year. Beginning with the month of September and arranging the occurrences consecutively according to the days of the month, we have on September 4, 1927, one female that was banded; on September 8, 1925, two banded and recorded as female or immature; and on September 12, 1927, one female or immature banded. For the month of October there was one female banded October 4, 1928; one heard in abutilon October 8, 1927; one female seen October 19, 1927; and one seen in abutilon October 28, 1928. In November there was one female trapped on November 5, 1928, and one female seen in abutilon on November 27, 1928. One banded on December 11, 1927, was recorded as a female or immature after comparing it with skins from the collection of J. Eugene Law and studying it with Mr. Law. This bird is the prize of all our orioles; banded on December 11, 1927, it was in our traps again on November 5, 1928 (the one mentioned above on that date), and on May 21, 1929. It was a female. On January 1, 1929, a female or immature was banded, and on February 5, 1927, one member of the family heard an oriole and another member saw it to be a female or immature Arizona Hooded. On March 13, 1932, one was heard by two members of the family; on March 15, 1927, a male was seen and heard, and on March 28, 1927, a male which had been banded on June 8, 1926, returned to our traps. This gives us an actually trapped Arizona Hooded Oriole for every month of the year except February in which month one was both seen and heard.

Of the whole 205 banded only five returned to our traps in a succeeding year. One of these returned a second time as mentioned above. Another return record, making seven in all, was that of an immature banded on June 27, 1929, and found dead on April 17, 1930, in Alhambra, about three and one-half miles south of our station.

In searching *The Condor* for notices which might extend the range of time for this bird in this vicinity beyond that given by Willett (*loc. cit.*), the following by Roland Case Ross (Condor, XXVI, 1924, p. 226) was found. "Mr. and Mrs. Charles Francis Saunders tell me that Arizona Hooded Orioles . . . in their yard are fond of the flowers of the flowering maple (so-called) and probe the pendent bells by reaching down with the foot and pulling the face of the flower up". That day at the lunch table we were saying that we had not seen that performance when we heard the chatter of an oriole in a flowering maple outside an open door. There was one of the first males of the season, and as we looked he reached for a flower that was hanging a few inches to one side and slightly lower than his perch, grasped it with his beak, swung it near his perch, caught it with one foot, keeping only the other foot on his perch, and held it there in an approximately horizontal position while he probed

with his beak between the calyx and corolla. This is the place they always probe, in so far as we have observed.

We must not fail to mention the Troupial (*Icterus icterus*) which caused so much excitement when found in a trap on June 16, 1928. Its golden iris, bright plumage (in general much like the male Baltimore Oriole), its large size, strong feet and inclination to bite and to grasp with the feet were all calculated to make deep impressions. We were fortunate in having both Mr. Law and Dr. Storer at hand to help us identify this bird and the specimen is now in Mr. Law's collection. It probably had escaped from some aviary.

In conclusion the main inferences which seem justified by the facts recited are:

That the population of San Diego Spotted Towhees probably was increased in number and surely was increased in permanence because of the greater abundance of shrubbery and leafy ground cover;

That our trapping records are influenced by so many difficultly controlled variables that they do not reflect truly the abundance of resident San Diego Towhees although they do show the general trend;

That our trapping records show quite closely the visits of transient San Diego Towhees and Fox Sparrows and probably of other birds of similar habits;

That the abundance of Arizona Hooded Orioles has not been affected by the changes in our yard;

That Arizona Hooded Orioles may be expected in Pasadena and vicinity any month of the year, but that their occurrences between early September and late March are unusual.

Pasadena, California, April 21, 1932.

THE ECONOMICS AND MANAGEMENT OF BIRD CONTROL

By W. L. McATEE

U. S. Biological Survey

Economic value is a leading reason for bird protection. It is not the only reason, however, and it is not one that is without exception. Exceptions run all the way from sporadic and trifling misbehavior by otherwise highly useful birds, to habitual and serious depredations on the part of species intrinsically much less beneficial.

In the case of birds that do comparatively little harm, it has always been the practice to overlook it on the principle that the laborer is worthy of his hire. This hire, although a public debt, has been paid as a toll on crops by agriculturists with little or no protest, because it has not amounted to much, and further because the farmer affected often realized that there was a counterbalancing benefit accruing to him personally.

When damage becomes serious, however, especially in restricted areas, and to specialized crops, the agriculturist justifiably feels that some relief should be afforded him, as the good, if any, done by the birds concerned, may not be on his property, and thus in no way offsets his losses.

There are those who urge, nevertheless, that in these days of notorious agricultural over-production, the losses should be taken in a philosophical manner, since a decrease in production is desirable. This point of view, however, ignores the fact that over-production is a public, not an individual, phenomenon. To the individual grower, over-production is theoretical; it may or it may not occur and his only safe course is to proceed according to the latter alternative. Under-production can never be of advantage to the individual. If production could be so regulated that the supply (pest damage disregarded) would just equal the demand, measures to control depredations would then be absolutely necessary, and finding them a matter of vital public concern. Under present unregulated conditions, control of pest damage is of individual concern, and in the absence of an arrangement for public sharing of the losses, vitally necessary.

The individual agriculturist is under the strongest economic compulsion to produce as good a crop as he can both in quality and quantity. Bird damage not only may cut down production, but in the case of fruit crops especially can rapidly lower quality and cause the loss of profits that seemed almost within the farmer's grasp. The fact that birds are generally useful is no comfort and no compensation for the individual sustaining serious losses. What is needed is a sharing mechanism, one that in effect will assess those benefiting by the services of birds in aid of those suffering damage. The only way in which this can be accomplished is by public action, and the question is of what kind?

Legislation protecting birds is formal acknowledgment of public interest in the utility of birds, and most bird laws in some way concede that there is community interest also in the destructiveness of birds. This is indicated in various ways, as by excepting certain species from protection, by providing for special modification of protected status when serious damage is being done, or by a saving statement that nothing in the law shall be construed to forbid defense of crops or other property attacked by protected birds.

These concessions it will be noted throw the burden of defense upon the individual suffering losses. Thus while the public by positive measures protects birds when useful, as a rule it acts only negatively when they are destructive. It would

seem that this situation should be altered, as it is certainly logical that responsibility for damage by protected birds should rest upon the protecting agency.

The most direct way of fulfilling this responsibility is to pay for damage done, and this course has been adopted in some States. For many years Massachusetts and Vermont have been appraising and paying for damage done by deer, and these arrangements with improvements necessitated by experience are still in force. The method requires careful administration, however, to prevent fraud as it is difficult to set up sufficient legislative safeguards to entirely prevent this form of chicanery. The system of direct payment of damages is certainly the one that should receive the support of those who urge absolute or nearly absolute protection for birds or other forms of wild life capable of doing damage. Appraisal and payment of damage requires personnel, correspondence, and field work, however, and for these reasons proposals to adopt the practice usually are not well received.

Another method is for the public to carry on whatever control measures are required, but this is objected to on the same score of increased official expense and personnel. This method, which can be made the most effective and discriminating of any, is strenuously combated also by those opposed to bird control, because of the recognized and permanent status it gives to a procedure abhorrent to them. It is in effect, moreover, a governmental subsidy to the activity concerned, another idea not readily tolerated.

Both of the alternatives thus far mentioned would fail to assist in the case of birds entirely unprotected by law, and naturally these are likely to include the species doing most damage. In a way there is partial public responsibility for depredations of these species, as they undoubtedly benefit by the generally protected status, and public sentiment in favor, of birds, as well as by sharing in the protection afforded by refuges, by trespass and cruelty-to-animals laws, by restrictions upon use of firearms, traps, poisons, and so on.

A third arrangement, namely, for individuals to solve their own control problems, often has resulted in the use of too dangerous methods in indiscriminate ways. To be acceptable, control operations by individuals need to be supervised or at least competently instructed, which brings us back again to the practical necessity of public participation in the matter.

If public agencies make investigations as to what is advisable and by experiment perfect methods of control, then pass this information on to the individual sustaining losses, steps would be taken that would combine due public aid and guidance, with conditions that would tend to hold bird control to the minimum. This system would largely restrict control to the cases where it proves economically feasible, that is, where it can be carried on as a part of the regular routine of crop production, figured into the costs, and still allow a margin of profit. If this governing influence could be made a factor in all bird control activities, it would go far toward insuring that they would be carried on only when really needed. This system would be an acknowledgment of public responsibility in the problem, it would offer limited public cooperation, and would turn bird control activities over to the individuals most concerned in a way that would tend to prevent abuse.

Washington, D. C., July 28, 1932.

THE PLEISTOCENE STORKS OF CALIFORNIA

WITH ONE ILLUSTRATION

By LOYE MILLER

The first announcement of stork remains from the fossil beds of California was made over twenty years ago (Miller, 1910). The remains were most limited and all came from one horizon of Pleistocene age, the asphalt of Rancho La Brea. At that time the excavations at the asphalt pits were thought to be about completed and there was little prospect of further specimens coming to light. Since then, more than one hundred thousand bird bones have been taken from the same deposit, while several thousand more have been taken from the other two Pleistocene asphalt beds, at McKittrick and Carpinteria. With this remarkable assemblage of material an anomalous situation has arisen with regard to certain species that have survived to the present time, that is, we turn to the fossil material to learn the variability of the species. The combined museums of the world could not supply the worker with one hundred tarsi of the present-day California Condor, yet in one museum, we have many times that number of specimens from the Pleistocene deposits of the State.

The passerine birds and other small species of our contemporary fauna are represented in collections of cabinet skins by large series of individuals, but the osteologist is commonly expected to be content with an occasional skeleton or two. These are generally of the larger species and too often they are mounted or ligamental skeletons which serve as a mere source of irritation or a "cup of Tantalus", for all minute characters are concealed under ligamentous tissue.

During the early study of California storks, one specimen each of *Ciconia alba, Euxenura maguari* (of authors = *E. galeata*), *Mycteria americana,* and *Jabiru mycteria* were available, and the fossil material was entirely too limited to give adequate indications of variability. Today, the situation is but little improved as to Recent skeletons, but Pleistocene material, though still comparatively rare, has become sufficiently abundant to make a re-survey of the situation warrantable. Comparative material was loaned by the American Museum of Natural History and by the United States National Museum. The Pleistocene storks at the Los Angeles Museum, the California Institute of Technology, the Museum of Natural History at Santa Barbara, and the Museum of Paleontology at Berkeley were all made available for study. To these several institutions and their courteous curators the author extends sincere thanks.

Genera Represented.—With the exception of the single lower mandible of *Mycteria americana* (now lost) in the collection of the Los Angeles High School, all the fossil storks examined from the California Pleistocene are here classified in one genus of one variable species. On several earlier occasions there have been two genera and species recorded (Miller, 1910 and 1925), the distinction being based upon size and upon certain osteological variations, both of which distinctions have fallen to the ground with the increase of our Pleistocene collections. This material differs from all living American storks and is included in the species *Ciconia maltha* originally described from Rancho La Brea. Discussion of the original generic assignment included the following statement: "The generic distinction between *Euxenura* and *Ciconia* is based largely on external features, and even these features are considered by some students to exhibit insufficient differences to warrant recognition of the separate genus *Euxenura.* Conceding that the differences between existing forms are of generic value, the form under discussion would not agree with either genus and

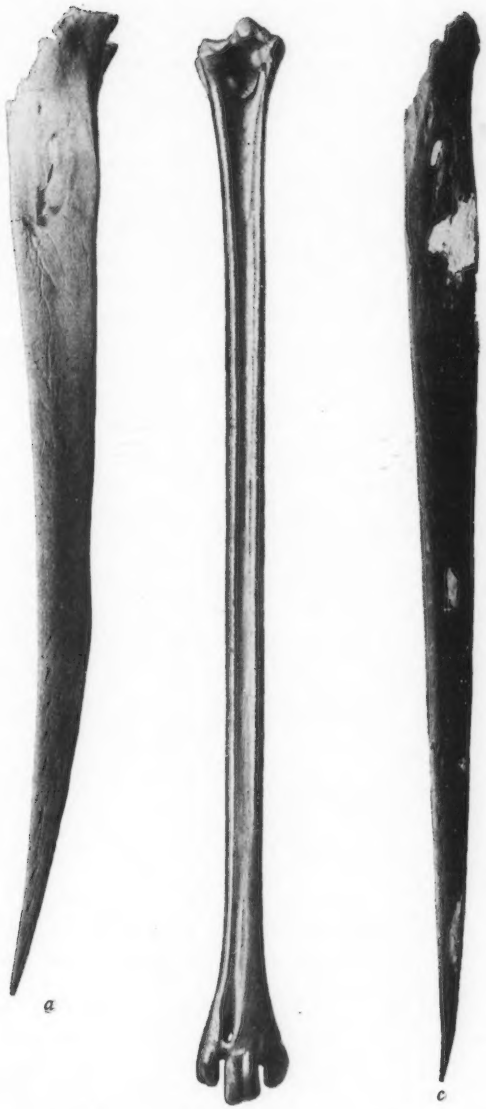

Fig. 23. *a*, MANDIBLE OF *Jabiru mycteria* (Recent).
b, TARSOMETATARSUS OF *Ciconia maltha* (fossil).
c, MANDIBLE OF *Ciconia maltha* (fossil).
Drawing by Mr. J. L. Ridgway.
Photographs by Dr. R. B. Cowles.
All figures to same scale, approximately 5/9.

a new genus would be necessary. While there is little question that, were the asphalt stork restored to us in its entirety, it would likely exhibit characters sufficient for its generic distinction, yet for the sake of simplicity it is referred, in the absence of those superficial characters, to the genus *Ciconia*."

The opinion might be advanced that it is unlikely that the genus *Ciconia* should occur in both eastern and western hemispheres and hence *Euxenura* should be used to designate the New World stork. This argument should be given small consideration in the light of such cosmopolitan, related genera as *Ardea*, *Egretta*, *Butorides*, *Botaurus*, and *Nycticorax*. Wetmore (1928 and 1931) records *Jabiru mycteria* from subfossil remains from Cuba and as true fossils from Pleistocene deposits in Florida. He also assigns *Jabiru weillsi* Sellards to the surviving species *Jabiru mycteria*. It is quite proper then to expect the California deposits to yield representatives of the same genus. Thus far they have failed to appear.

Comparison of *Euxenura* with *Jabiru*.—*Euxenura maguari* and *Jabiru mycteria* differ notably in size when the limited Recent material is compared. *Jabiru* is much the heavier bird in body mass and relative strength of the limbs. Comparison of the several characteristics of the skeleton shows differences as listed below.

1. *Tarsus.* Viewed from in front, the tarsus of *Euxenura* has a broad, rather shallow excavation in the region of the papilla of the tibialis anticus. This area is narrower and deeper in *Jabiru*. The shaft of the bone is much narrower in *Euxenura* even though the head is just equal to that of *Jabiru*. The effect is of a more positive "flaring out" at the proximal end. With the exception of one juvenile bird, the Pleistocene specimens resemble *Euxenura* more than *Jabiru*.

2. The intercotylar tuberosity is blunter and less deeply undercut on the external side in *Euxenura*.

3. Seen from the outer side the head is far less in diameter as measured through either the hypotarsal ridges or from the bottom of the furrow between them.

4. Seen from the rear, the hypotarsal ridges are much closer together and the outer instead of the inner is the longer. There is, just above the hypotarsus, a deep pit separating the hypotarsus from the cotylar area. This pit is practically wanting in *Jabiru*.

5. Viewed along the axis from the proximal end, *Euxenura* is again seen to have a much less robust tarsus. The cotylae have a much shorter sagittal diameter in relation to the transverse dimension.

6. At the distal end, the tarsus is much smaller, the entire foot is narrower, the trochleae are smaller and the inner toe is set farther back throwing the three trochleae into a more strongly curved arc.

7. *Tibiotarsus.* Viewed from the proximal end, the tibia of *Euxenura* seems to have more rugged contours, depressions are more sharply marked, and crests rise more abruptly. The outer cnemial crest is thrown farther to the fibular side, and the whole articular area is broader in relation to its sagittal diameter.

8. As in the tarsus, the shaft is more slender though but slightly shorter.

9. At the distal end the width increases to equal that of *Jabiru*. The condyles are smaller in diameter but are separated from each other by a broader intercondylar groove.

10. The tubercle above the osseous bridge is sharper and lies practically on the median line instead of toward the fibular side.

11. The outer attachment of the ligamentous band over the flexor tendons is placed farther up the shaft.

12. The pit into which the intercotylar tubercle of the tarsus fits during articulation is less circular in both species than it is in *Ciconia alba*; it is expanded to the inner side and encroaches upon the inner condyle in *Euxenura*, thus offering a superficial resemblance to *Grus*.

13. In size there is greater disparity between the extremes of available *Euxenura* than there is between the largest *Euxenura* and the one available *Jabiru*.

On the basis of the above comparison of distal leg bones in Recent storks, the fossil specimens have been carefully scrutinized. All tarsi and tibiae fall into one group showing affinity with *Euxenura* and not with *Jabiru*. The only character showing notable diversity is the (1) and (2) combination, a character which may depend upon age of the individual. Actual size of the fossils varies greatly, extending well beyond the Recent *Jabiru*.

Femur. In *Euxenura* the linea aspera is simpler and lies nearer the inner profile of the shaft, the entire bone is more slender, the pneumatic foramen on the proximo-anterior area is placed higher up under the trochanter and the pattern of the muscle scars is variable.

In all the fossil femora examined, relationship appears closer to *Euxenura* though the length ranges above that of *Jabiru*.

Anterior Limb Bones. Only fragments of the humerus have been collected. Insofar as they are preserved, these parts resemble *Euxenura* though they are as large as *Jabiru*.

The carpometacarpus is extremely long and slender. The radio-ulnar diameter of the greater digit is less than in *Jabiru*, and the maximum transverse over-all dimension of the bone is less though the length may reach 13.3% in excess. The wing, like the leg, seems to point to the species as a slender limbed bird in comparison with the living *Jabiru*.

The coracoids of the fossil birds run slightly less than *Jabiru*, but not so much so as one would expect from a study of the limb elements.

Furcula. A marked difference appears among the American storks in the way in which the furcula is attached to the sternal carina. *Jabiru* shows a pedunculate furcular process of some 6 mm. length and definitely reflexed toward the carinal apex. *Euxenura* makes contact with the carina by a broad tabular facet which is not at all pedunculate. All fossil stork furculae examined have the character of *Euxenura* in this contact. Other parts of the furcula are not available for study owing to method of preparation of the loaned material.

Mandible. Fortunately an almost perfect lower mandible of this interesting fossil stork is preserved in the collection at the California Institute of Technology.

The right articular region is the only part lacking, and the left articulation is but slightly fractured. The specimen differs from *Jabiru* in being quite appreciably longer (8.8%), but with a much shorter symphysis. The fossil mandible has a total length of 355.4 mm., with a symphysis of 106.5 mm. (30%). In *Jabiru* the total length is 326.6 mm. and the symphysis is 152 (46%).

Euxenura has a beak length of 288 mm., with a symphysis of 109.8 (38%). *Ciconia alba*, with a beak length of 217 mm. and a symphysis of 64 mm. (29%), shows closest approximation to the fossil mandible.

In all species examined the upward curvature of the mandible is almost entirely accomplished in the symphysial portion. The greatest degree of upturn is seen in *Jabiru*, the least degree in *Ciconia alba*, and an intermediate degree in *Euxenura*.

The fossil ramus displays a curve intermediate between *Euxenura* and *Ciconia alba*. The total length exceeds that of any other specimen examined.

The accompanying table of measurements is taken from Recent specimens as listed: *Euxenura maguari*, U. S. Nat. Mus., no. 49041, male; U. S. Nat. Mus. no. 19940; the author's collection, no. 204. *Jabiru mycteria*, Am. Mus. Nat. Hist., no. 2931.

Pleistocene material comes from Rancho La Brea and McKittrick localities and is drawn from the collections of the University of California, the Los Angeles Museum, and the California Institute of Technology.

TABLE OF MEASUREMENTS OF STORKS, RECENT AND PLEISTOCENE

All diameters in millimeters		*Ciconia maltha*			*Euxenura maguari*, 204	*Euxenura maguari*, 19940	*Euxenura maguari*, 49041	*Jabiru mycteria*, 2931
		Minimum	Maximum	Mean				
Tarsus	Total length (2 specimens)	307	314	310.5	267	247	230	302
	Transverse diameter through trochleae (10 specimens)	24.4	26.3	25.4	24.5	22.2	21.8	25.7
	Transverse diameter through cotylae	23	25.7	24.8	23.9	21.5	20	23.8
Tibia	Total length	....	....	....	311	283	274	351
	Sagittal diameter through condyles (12 specimens)	23.2	25.4	24.8	22.5	21	20.5	24.7
	Transverse diameter through condyles (12 specimens)	19	20.8	19.9	19.4	18	17.3	19.1
Humerus	Total length	....	....	....	224	220	212	257
	Maximum diameter, distal end	....	....	....	34.6	32.1	32.1	40
	Maximum diameter, proximal end (one specimen)	....	....	51.5	44.9	42.9	41.4	52.5
Carpus	Extreme length metacarpal II (3 specimens)	138	150	139	120.7	116	112	132.8
Coracoid	Maximum length	....	....	....	98.8	93.7	....	115
	Maximum basal width (3 specimens)	106	113	109.5	37	35.5	....	42.7
Beak	Length from nasofrontal suture	....	....	....	246	....	194	287
Mandible	Length over all (1 specimen)	....	....	355	288	....	225	326
	Length of symphysis (1 specimen)	....	....	106	110	....	....	152
	Maximum depth (1 specimen)	....	....	25.2	20.7	....	18	29.7

Conclusions.—Stork remains occur in three Pleistocene asphalt deposits of California: Rancho La Brea, McKittrick, and Carpinteria.

Their relative abundance is greatest at McKittrick.

With the exception of a single fragment now lost, all specimens are assigned to a single species, *Ciconia maltha*.

This species is quite constant in all characteristics except size. The range of size variation includes both the Jabiru and the Maguari Stork, extending beyond them at either end of the scale.

The species has less dorsal curvature of the mandible than any other American stork.

It was longer limbed but more slenderly built than either the Jabiru or the Maguari Stork.

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University of California at Los Angeles, May 10, 1932.

NOTES ON FIFTEEN SPECIES OF BIRDS FROM THE SAN FRANCISCO MOUNTAIN REGION, ARIZONA

By LYNDON L. HARGRAVE

Bird studies in the San Francisco Mountains, Arizona, have been few and sporadic and no year-'round records have been kept. Most observers contributing to the ornithology of the region have been members of early railway surveys or representatives of institutions from other states.

The steep vertical sides of The Peaks, with zones from the Upper Sonoran to the Arctic, which offer most excellent opportunity for the study of many problems that otherwise would require prohibitive time and expense, the many mountain lakes which at seasons teem with wild fowl but which have practically been unknown since the days of Mearns, and the nearness of the Painted Desert of the Little Colorado make this region extremely attractive to the bird student. The San Francisco Mountains are historic grounds and the field-worker is constantly reminded of Woodhouse and of C. Hart Merriam and of the valuable contributions made by them to biological science.

Since my duties center about Flagstaff during the winter months, and take me into the surrounding country at other seasons, opportunities for daily observations of birds, often for many weeks in a limited region, have resulted in the accumulation of many data, a small portion of which is given herein. These records are miscellaneous and are outside of definite problems, but, nevertheless, are unique for the region. The numbers of the specimens listed are those of the Museum of Northern Arizona.

Ardea herodias treganzai. Treganza Blue Heron. On May 3, 1931, one was seen at Marshall Lake (elevation 7133 feet), twelve miles southeast of Flagstaff. Jenks (Technical Bull. no. 5, Grand Canyon National Park, Ariz., 1932, p. 8) lists four other records for the San Francisco Mountain region.

Buteo borealis krideri. Krider Red-tailed Hawk. Near Doney Park (Transition Zone, elevation 6500 feet), at the east foot of Elden Mountain, on October 12, 1931, about twelve buteos were noted along the highway for about ten miles. All were much lighter in color than *B. b. calurus* so common in the region. One of these hawks was collected, no. 2652, and sent to Mr. T. T. McCabe, Museum of Vertebrate Zoology, Berkeley, for identification, who stated by letter that this specimen was also examined by Swarth. Mr. McCabe writes in part: "He (Swarth) and I have both taken identical birds in central British Columbia. These are the only immatures which are as light as yours in two cases full in this Museum. Swarth has seen equally light breeding birds from the north-central states and suspects that *krideri*, which he thinks was named from a similar form, stretches thence northwesterly, as many forms do. This is why I called your bird *krideri*, a very doubtful designation." This seems to be the only specimen of this phase from the State. With the exception of *B. regalis*, I have not observed other light buteos in the region.

Pandion haliaëtus carolinensis. Osprey. The Osprey unquestionably is at times found along the Little Colorado River, Arizona, as the Hopi Indians are familiar with the species; but I have been unable to find published records of the occurrence of this bird in the Transition Zone of the plateau of northern Arizona. On the plateau, however, there are many lakes that abound in fish and the Osprey should be of fairly common occurrence. On May 3, 1931, I saw one of these birds come in to Marshall Lake, make a catch, and immediately leave the vicinity. Recently I have examined a mounted Osprey which was shot by D. M. Kiltridge in the timbered section of Oak Creek, about 20 miles south of Flagstaff, on November 3, 1931.

Catoptrophorus semipalmatus inornatus. Western Willet. On April 24, 1931, a lone Willet was observed for some time on the shore of Marshall Lake. I was able to approach quite close to the bird and study it through glasses. On stalking closer it flew a short distance, thus enabling me to study it on the wing, when its markings were quite striking. This, I believe, is the third specific record for the State, and

though only a sight record I feel certain of the identification. The species has not been previously reported from the plateau of northern Arizona.

Columbigallina passerina pallescens. Mexican Ground Dove. This species was observed at Grand Canyon, Arizona, on October 18, 1931, by C. A. Bryant of San Francisco (Grand Canyon Nature Notes, vol. 6, 1932, p. 28). His appears to be the first record for northern Arizona. On the 30th of the same month I collected one, no. 2657, which I caught in a government sparrow trap at Coyote Range (Transition Zone, elevation about 7200 feet), about two and one-half miles northwest of Flagstaff. This second record for the plateau is, therefore, the first record for the San Francisco Mountain region.

Megaceryle alcyon caurina. Western Belted Kingfisher. Though considered a fairly common migrant throughout the State, I know of only one other record from the San Francisco Mountain region, that of Jenks (Technical Bull., no. 5, p. 16). On April 24, 1931, one was seen by me at Marshall Lake, and on May 3 of the same year, Mr. Jenks and I were surprised to find one in quaking aspens (*Populus tremuloides aurea*) bordering a watering hole at the England Ranch in Hart Prairie (elevation 8400 feet) in the Canadian Zone on the southwest slope of the San Francisco Peaks. The bird kept up an incessant clattering and though we watched it for some time, it did not leave the trees. The pool, commonly used for watering stock, was muddy and at this season could contain little of animal life. There are no running streams in these mountains and even springs are few and widely scattered.

Several records are reported from other sections of the plateau (Jenks, *loc. cit.*), and McKee (Preliminary Check List of Birds of Grand Canyon, 1931, p. 6) on the authority of Vernon Bailey reports nest holes on the west side of Bright Angel Creek (Lower Sonoran Zone). This appears to be the most definite evidence yet recorded of the species breeding within the State.

Sayornis nigricans. Black Phoebe. On April 17, 1931, I observed a single bird flycatching about a pool of water under a cliff below Lake Mary dam. Jenks (*loc. cit.*, p. 18) reports nesting records from the bottom of the Grand Canyon and a summer record from Flagstaff. I have been unable to find other records for the plateau region.

Corvus corax sinuatus. American Raven. Though this bird is considered to be a common species throughout the State, I have surprisingly few records for the Transition Zone of the plateau. A single bird was recorded at Coyote Range on December 31, 1930, and two were noted at the same place on March 3, 1931. On April 24, 1931, a flock of twelve was seen feeding on carrion at Marshall Lake, and two were observed at Walker Lake (elevation 8500 feet) on June 28 of the same year. Not again noted until March 9, 1932, when three were observed at Coyote Range.

Corvus brachyrhynchos hesperis. Western Crow. The scarcity of published records of migration for the State will warrant the following details. On April 24, 1931, a flock of six was seen at Marshall Lake. The following September about twenty were noted near Flagstaff during the last week of the month. None was seen by me during the summer months. On March 9, 1932, a flock of about twenty-five was seen in pine woods on the outskirts of Flagstaff; on the 10th, a flock of twelve was observed at Coyote Range; and, on the 11th, several small flocks were noted. On the 12th several Crows were seen to rise from a pine thicket north of Flagstaff. I attempted to count them but after counting 50, the main body of the flock arose. I should judge there were at least 150 individuals. Two other small flocks were later seen near the same place. Common in the same region on the 13th. Two were seen at Coyote Range on the 14th; one, no. 2709, was collected. Singles or pairs were observed on the 15th, 16th, and 17th. After this date until this writing one or two pairs have been seen several times a week at Coyote Range or vicinity. All flocks observed were flying west, a necessary direction of flight in order to skirt the high mountains. I was informed that Crows were common five miles east of Flagstaff during this same period.

Certhia familiaris montana. Rocky Mountain Creeper. A summer visitant to the San Francisco Mountains; one winter record from northern Arizona (Swarth, Pacific Coast Avifauna No. 10, 1914, p. 76). At Coyote Range, December 19, 1930, three Creepers were seen traveling with a large flock of Pygmy Nuthatches. Another Creeper was seen in the same locality on April 13, 1931. These are the only records I have for this bird though Jenks (*op. cit.*, p. 21) states that this Creeper is a permanent resident in the San Francisco Mountains but does not give his evidence for the statement.

Agelaius phoeniceus fortis. Thick-billed Red-wing. On December 12, 1931, I saw a small flock of Red-wings at Coyote Range; there was much snow on the ground and the temperature was below freezing. At the same place, on the 13th, I caught a flock of eight, presumably those seen the day before. A male, no. 2664, and a female, no. 2665, were collected and the others were banded. These specimens have been identified by Mr. McCabe. This, I believe, is the first winter record from the plateau region. The species is uncommon in the region (Ridgway, Birds of North and Middle America, Part II, 1902, p. 339) and though Swarth (Condor, XXVI, 1924, p. 187) recorded several small flocks on Deadman's Flat north of the San Francisco Peaks in the fall of 1922, none was observed by me in that region this past fall. On March 4, 1931, several Red-wings were seen at Davenport Lake (Transition Zone) about 25 miles west of Flagstaff, and though Jenks (*op. cit.*, p. 26) reports numerous spring and fall records for the general region I know of no other specimens.

Passerina amoena. Lazuli Bunting. In 1914, Swarth (Pacific Coast Avifauna No. 10, p. 61) was unable to cite records of the occurrence of this species in northeastern Arizona. On May 16, 1931, several of these birds were seen at Indian Gardens (Lower Sonoran Zone), Grand Canyon National Park (McKee, Grand Canyon Nature Notes, vol. 5, 1931, p. 83), and Jenks (Tech. Bull. no. 5, p. 26) records them as breeding at that place. The first record for the Transition Zone of the plateau and for the San Francisco Mountains, I believe, is the record of three pairs seen by me at Coyote Range on July 18 where they were observed feeding on "oats in the milk." Ten were seen in the same oat patch on the 25th and two on August 1. These observations were made on Saturdays and Sundays, and as I was away during other days I presume that the birds were there on the intervening dates.

Loxia curvirostra bendirei. Bendire Crossbill. This species is not included in Swarth's Distributional List of the Birds of Arizona (Pacific Coast Avifauna No. 10, 1914). The first specimen for the state seems to be one taken by G. E. Sturdevant on the South Rim, Grand Canyon National Park, during the fall of 1927 (McKee, Preliminary Check List of the Birds of Grand Canyon, 1931, p. 14). The second record appears to be a male taken by Dr. Alden H. Miller on June 25, 1931, in the Kaibab Forest, north of the point of first capture (Condor, XXXIV, 1932, p. 99). A male, no. 2655, identified as of this subspecies by Mr. McCabe, was taken by me at Coyote Range on October 26, 1931. There were about twenty-five birds in the flock, which included both sexes. Crossbills have been numerous in the locality since the first week of October, but all other specimens taken were *L. c. stricklandi.* On March 21, a flock of about fifteen was observed. They were heard singing for the first time this year. Last noted April 10.

Junco oreganus thurberi. Thurber Junco. A Junco, number 2666, taken by me at Coyote Range on December 3, 1931, has been identified as of this subspecies by Dr. Alden H. Miller. This appears to be the first specimen of this bird taken on the plateau. Dr. Wetmore has informed me by letter that one specimen collected by Coues at Prescott, Arizona, has been identified by Dr. Herbert Friedmann as of the race *thurberi.* Until this year the Prescott record seems to have been the most northerly record for the State.

Spizella arborea ochracea. Western Tree Sparrow. In 1914 the only published records of the occurrence of this species within the State refer to two specimens taken by Kennerly in the Valley of the Little Colorado River and to a statement by Henshaw, who reported it, on the authority of Bendire, as of occasional occurrence in winter in the vicinity of Tucson (Swarth, Pacific Coast Avifauna No. 10, p. 54).

Kennerly was a member of Lt. A. W. Whipple's party which, in 1853, surveyed the country in the neighborhood of Flagstaff for a feasible railway route to the Pacific. A review of Whipple's report (Reports of Explorations and Surveys, 1853-6, III, 1856, chapters IX and X) shows that the time between December 13 and 20 was spent by the main body of the party, which included Kennerly, in working from a point identified as Winslow to the junction of Canyon Diablo and the Little Colorado River where the party camped on the 20th. The first of these specimens, taken on the 18th, was, therefore, taken some distance to the west of Winslow, while the second, taken on the 20th, must have been collected in the neighborhood of Leupp, on the edge of the San Francisco Mountains Volcanic Fields, only a few miles from the base of the San Francisco Mountains.

In the late afternoon of December 12, 1930, I saw three sparrows which I believed to be this species, but the light was too bad for definite identification. In the morning of the 15th, however, I again saw three sparrows which I was able to approach within about twenty feet and identify with certainty as this species. The birds were only about 200 feet from the point where the sparrows were seen on the 12th. It is important to note, in this connection, that no other species of sparrow has been recorded from this region during the winter months.

I met with the Tree Sparrow again on November 18, 1931. On making the rounds of my traps I found one in a house trap with several Juncos. The bird (no. 2658) was collected and has been identified by Mr. McCabe. I had not seen the bird before capture in spite of the fact that the trap was within twenty feet of my office window and I feel almost certain that the bird was traveling alone. On the 21st a Tree Sparrow was observed feeding about the office and trap. There was much snow on the ground, and, with the exception of the feeding station and the tops of a few weeds, all seeds were buried. These two birds were the only individuals of this species which were seen by me this past winter.

Jenks (Technical Bull. no. 5, p. 29) records numerous spring records for the San Francisco Mountains, though no details as to date and manner of occurrence are given.

Museum of Northern Arizona, Flagstaff, April 15, 1932.

FREQUENCY OF OCCURRENCE OF BIRDS IN YOSEMITE VALLEY, CALIFORNIA

BASED ON RECORDS BY MR. AND MRS. CHARLES W. MICHAEL

WITH TWO GRAPHS

By JEAN M. LINSDALE

The problems involved in the determination of populations of birds deserve the serious attention of all field naturalists. Discussions of this subject doubtless will be profitable for a long time. Such studies provide basic material for, or contribute to, so many phases of natural history that it is surprising that so little attention has been devoted to them in the past. Reference is often made to the inadequacy of the commonly accepted usages for expressing the relative abundance of animals. The insufficiency of our knowledge of animal populations is made obvious whenever an attempt is made to determine actual numbers of individuals present on any given area.

Possibly the most difficult of these problems is the determination of actual numbers of a given species or group of species. With the exception of a very few kinds this seems to be practically impossible to accomplish for birds—even when limited, small areas are concerned. In practice, census counts of birds are estimations of approximate numbers and are reliable mainly in proportion to the knowledge and acumen of the observer who makes them. Capabilities of field naturalists vary so greatly that it is impossible to get more than the most generalized results from comparing census counts made by more than one observer.

My own enquiries into the question of determination of numbers of birds suggest that in view of the limitations of method as now known it is more profitable to try to determine the relative frequency of occurrence of birds for a given region than to try to make counts of all the individuals present. An adaptation of a method used by botanists in population studies of plants, which helps in expressing the relative frequency of occurrence in birds, has been given briefly in outline (Condor, xxx, 1928, pp. 180-184).

Raunkiaer derived what he called the Law of Frequence from eleven different pieces of botanical work carried on by himself and others in different parts of Europe. In nearly all such surveys it is learned that there are many more species of low frequence than of high frequence. A curve expressing the numbers in the different classes of frequence has two peaks, a high one expressing the least frequence, and a lower one expressing the greatest frequence. If the species of frequences of respectively 1-20 per cent, 21-40 per cent, 41-60 per cent, 61-80 per cent, and 81-100 per cent are grouped into classes designated as A, B, C, D, and E, the law of frequence might be expressed A>B>C>, equal to, or <D< E (Kenoyer, Ecology, VIII, 1927, p. 343).

This application to birds rests upon the primary assumption that in the area studied the number of days of observation of a bird species will reflect the extent of area occupied and the total number of individuals present, or, that over a reasonable number of days the more numerous species will be observed more often than the less numerous ones. It is recognized that several factors are at work to decrease the reliableness of such computations. For example, nocturnal birds will naturally rank lower than diurnal ones present in equal numbers. Small birds of retiring habits will be slighted in comparison with large birds of obtrusive habits. Varying weather conditions will be reflected in numbers of birds observed, and daily differences in the route or the distribution of attention of the observer are sure to influence the records.

It must be kept in mind that the perfection of environmental adaptation of a species is not always parallel to or reflected in its observed frequency of occurrence. Caution must be taken not to expect these simple indices to show too much about the avian population of an area. By recognizing their limitations we are in better position to make use of them in studying the true characters of a bird population.

In spite of the effects of all these detracting influences I feel confident that they are compensated for when the conditions outlined in this and my previous report are attended to. These involve among other requirements:

1. Selection of an area of appropriate size—such that one day's observation may be expected to indicate fairly the bird species present—and with definite limits.
2. Keeping records by a method sufficiently simple that analyses can be made without waste of effort.
3. Maintaining observation over a period of time sufficient to give adequate representation to the various kinds of birds. The optimum number of days for such a survey remains to be determined.

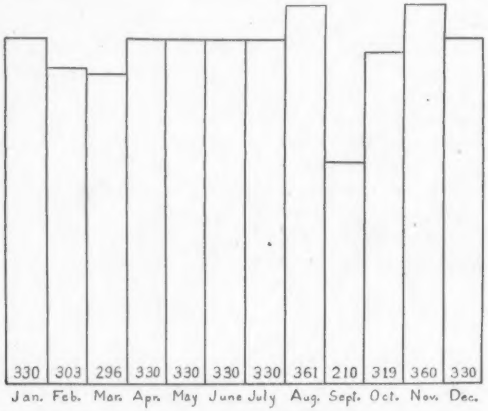


Fig. 24. CHART SHOWING DISTRIBUTION OF FIELD DAYS BY MONTHS.

4. Limitation of recorded observations to an area of a fair degree of environmental uniformity and hence, presumably, of uniform avifaunal make-up. Value of the results for comparative purposes is largely dependent upon proper consideration of this factor.

The index numbers (percentages) show on what proportion of the whole number of days of observation each species was recorded. If a species is recorded on twenty-five out of one hundred days it seems reasonable that it would be seen close to twenty-five days in another comparable sample of one hundred days on the same area; provided seasonal and other habitat conditions are not greatly modified.

Just as the frequency index for a plant may be made large or small by changing the size of the quadrats surveyed, it seems logical to expect that the corresponding figure, determined as here suggested, for birds would vary, depending upon the unit of time used. General experience in the field indicates that the most satisfactory unit of time is one day—although it is not absolutely necessary to spend the whole of each day in the field. My impression is rather definite that in a uniform habitat area the

number of species that will be discovered after the first four hours of observation in the morning will not be significant for purposes of this work. Comparison of the results obtained with those obtained and frequently reported upon in botanical surveys gives further verification to this supposition. The more uniform habitats probably require shorter periods of daily observation than the varied ones to record the species adequately.

Since the summer of 1920, Mr. and Mrs. Charles W. Michael have kept daily records of all species of birds seen by them on the floor of Yosemite Valley in Yosemite National Park, California. At the end of each month a summarized report of all observations for the preceding thirty days has been sent to the Museum of Vertebrate Zoology. Recently it occurred to me that these records would form excellent material for a test of the method now under discussion for showing relative frequency of occurrence of birds. Here were records carefully kept over a long period of time on a definitely restricted area by two persons of exceptional powers of observation. Accordingly, percentage of frequency was determined for each species for the whole period of time (August 1, 1920, to November 30, 1931) and for each of the twelve months. To obtain these percentages the total number of days each species was observed was divided by the total number of days on which observations were made. The percentages are shown in table 1 for each species which ranked above 20%. This table includes only forty out of the total of 151 species recorded, or approximately one-fourth of the whole number present.

TABLE 1.—THE FORTY SPECIES OF BIRDS FOUND MOST FREQUENTLY IN YOSEMITE VALLEY, CALIFORNIA, WITH PER CENT OF FREQUENCY FOR EACH MONTH AND FOR THE YEAR

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Blue-fronted Jay	100	100	100	100	100	100	100	100	100	100	100	98	99.8
Sierra Junco	97	100	100	100	100	100	100	98	100	100	100	96	99
Sierra Creeper	89	96	100	100	100	100	100	94	100	97	97	98	98
California Woodpecker	96	100	100	100	100	100	100	96	100	88	94	94	97
Red-shafted Flicker	89	78	98	100	100	100	100	100	100	100	98	89	96
Belted Kingfisher	80	98	92	100	100	100	100	97	86	100	92	74	89
Mountain Chickadee	63	95	99	89	80	79	85	84	96	95	82	80	86
Western Robin	52	74	97	100	100	100	100	100	100	78	61	27	80
Spurred Towhee	60	66	87	82	100	100	95	94	95	66	57	51	79
Hairy Woodpecker	62	59	66	84	85	93	86	79	74	78	73	71	76
Cañon Wren	59	71	72	82	83	60	65	76	55	81	86	90	74
Band-tailed Pigeon	27	31	53	88	100	98	100	99	97	87	45	30	71
California Purple Finch	29	41	51	88	92	100	90	43	11	20	22	25	61
Golden-crowned Kinglet	68	82	92	75	28	26	7	6	20	81	86	87	55
Red-breasted Nuthatch	39	38	60	71	74	61	44	53	66	48	89	41	52
Audubon Warbler	36	29	26	93	97	58	31	8	58	81	64	31	50
Water Ouzel	35	50	53	59	86	38	14	26	57	80	56	39	49
Ruby-crowned Kinglet	86	72	63	69	16	....	....	....	3	60	86	92	47
Chipping Sparrow	....	....	....	49	100	100	100	85	67	11	....	2	43
Brewer Blackbird	....	....	....	68	92	88	89	57	69	27	2	....	42
White-headed Woodpecker	59	62	54	64	61	63	16	16	25	33	38	53	45
Willow Woodpecker	32	15	33	51	36	53	68	56	42	25	27	34	40
Sparrow Hawk	8	13	25	53	58	43	62	60	60	27	36	14	38
Cassin Vireo	....	....	....	47	100	100	91	62	27	....	....	....	36
Black-headed Grosbeak	....	....	....	37	100	100	99	69	7	3	....	....	36
Yellow Warbler	....	....	....	12	98	100	100	91	10	....	....	....	36
White-throated Swift	....	2	29	68	99	98	70	37	57	1	....	....	35
Red-winged Blackbird	....	1	32	85	99	100	68	12	4	3	....	....	34
Wood Pewee	....	....	....	1	85	100	100	90	23	....	....	....	34
Western Bluebird	83	67	14	1	1	....	....	....	....	46	100	82	34
Western Tanager	....	....	....	5	95	100	94	69	35	....	....	....	34
Spotted Sandpiper	....	....	....	2	83	100	98	72	17	....	....	....	32
Warbling Vireo	....	....	....	47	100	100	86	18	81	....	....	....	31
Evening Grosbeak	....	1	14	32	66	63	50	69	54	12	....	....	30
Tolmie Warbler	....	....	....	7	77	100	76	65	16	....	....	....	29
Traill Flycatcher	....	....	....	....	34	100	100	86	19	1	....	....	29
Calliope Hummingbird	....	....	18	52	88	60	33	33	18	3	....	....	26
Violet-green Swallow	....	....	6	27	68	92	53	15	7	....	....	....	23
Black-throated Gray Warbler	....	....	....	52	92	56	13	19	20	2	....	....	21
Russet-backed Thrush	....	....	....	....	38	78	66	35	11	3	1	....	20

The figures and charts derived from the bird records in Yosemite are sufficiently interesting to invite further inquiry into their significance and the bearing of the method upon the general problem of bird distribution. In the first place it should be pointed out that the results here shown are in close agreement with those obtained

from similar studies of other classes of objects. That is, the Raunkiaer law applies to the distribution of many classes of objects, both animate and inanimate, in which occurrence is governed by a large number of factors. Furthermore, the results of this analysis are closely similar to those obtained in studies of frequency of birds in other localities in the United States, for example, in eastern Kansas (Linsdale, Condor, xxx, 1928, p. 180) and in northern Michigan (unpublished). The curves showing the arrangement of frequency indices for the three localities are remarkably alike.

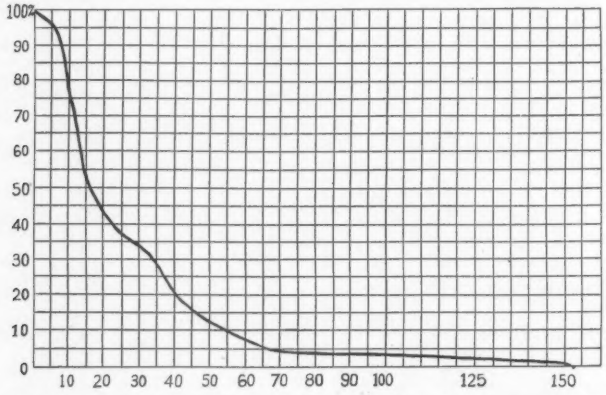


Fig. 25. GRAPH SHOWING RELATIVE FREQUENCY OF OCCURRENCE OF THE 151 SPECIES OF BIRDS THAT WERE RECORDED IN YOSEMITE VALLEY, CALIFORNIA.

Comparison of forty species of birds occuring most frequently (index more than 20%) in Yosemite Valley, California (left), and a small area in Doniphan County, Kansas (right):

1. Blue-fronted Jay	Cardinal
2. Sierra Junco	English Sparrow
3. Sierra Creeper	Crow
4. California Woodpecker	Chickadee
5. Red-shafted Flicker	Blue Jay
6. Belted Kingfisher	Tufted Titmouse
7. Mountain Chickadee	Carolina Wren
8. Western Robin	Downy Woodpecker
9. Spurred Towhee	Mourning Dove
10. Hairy Woodpecker	Goldfinch
11. Cañon Wren	Robin
12. Band-tailed Pigeon	Red-headed Woodpecker
13. California Purple Finch	Indigo Bunting
14. Golden-crowned Kinglet	Red-bellied Woodpecker
15. Red-breasted Nuthatch	Red-winged Blackbird
16. Audubon Warbler	Yellow-billed Cuckoo
17. Water Ouzel	Chimney Swift
18. Ruby-crowned Kinglet	Red-eyed Vireo
19. Chipping Sparrow	Baltimore Oriole
20. Brewer Blackbird	Western House Wren
21. White-headed Woodpecker	Wood Thrush
22. Willow Woodpecker	Wood Pewee
23. Sparrow Hawk	Whip-poor-will

24. Cassin Vireo	Ruby-throated Hummingbird
25. Black-headed Grosbeak	Cowbird
26. Yellow Warbler	Bell Vireo
27. White-throated Swift	Kingbird
28. Red-winged Blackbird	Bluebird
29. Wood Pewee	Blue-gray Gnatcatcher
30. Western Bluebird	Hairy Woodpecker
31. Western Tanager	Great Blue Heron
32. Spotted Sandpiper	Barn Swallow
33. Warbling Vireo	Northern Flicker
34. Evening Grosbeak	Catbird
35. Tolmie Warbler	Turkey Vulture
36. Traill Flycatcher	Crested Flycatcher
37. Calliope Hummingbird	Rough-winged Swallow
38. Violet-green Swallow	Dickcissel
39. Black-throated Gray Warbler	Tree Swallow
40. Russet-backed Thrush	Green Heron

The 151 species of birds of Yosemite Valley are distributed in the five classes of the Raunkiaer formula as follows: 111, 20, 7, 5, 8 or in the following ratio: 73, 13, 5, 3, 5. Corresponding figures for an area surveyed in Doniphan County, Kansas, were 133, 32, 13, 6, 10 and 68, 16, 7, 3, 5. In both cases the arrangement of the formula which applies is $A>B>C>D<E$. These results agree closely with those given by Kenoyer (*op. cit.*) for analyses of frequency distribution in plant communities.

Judging from the work of various botanists (Romell, Ecology, XI, 1930, p. 591) and from observations upon the local distribution of birds it seems probable that the application of the Raunkiaer law to occurrence in birds is closely connected with the following assumptions. First, that every species is adapted to a definite set of environmental conditions; second, that the factors which influence the presence of birds in the area analyzed vary from place to place according to pure chance around a mean value; third, that it is just as probable to have species which are adapted to the rare combinations of factors as to the more common ones in the area; fourth, that over a period of time birds are likely to be observed on numbers of occasions which parallel their numbers on the area. These assumptions appear to me to be in agreement with most of the information now available concerning the distribution of birds.

From the considerations outlined above it might be concluded that one of the topics urgently requiring attention in the field-study of birds is the one having to do with the particular factors which determine or influence the presence of each kind of bird. This involves the detection and analysis of responses of individual birds to environmental factors which have to do with occurrence.

A feature of analyses of frequency of occurrence according to the Raunkiaer method which deserves emphasis is that they provide results intermediate between the two methods most frequently used but without the chief disadvantages of those methods. The almost universal custom of subjectively estimating the relative frequency of birds and assigning general terms to the various classes (abundant, common, rare) has had its limitations pointed out so often that they are well known. The opposite practice, involving elaborate procedure in census taking, is less well known and less often attempted. However, there seems to be a definite tendency on the part of workers to give too much confidence to these counts and to practicability of the procedure in obtaining them. The chief disadvantages are the great amount of time and effort required (these are needed for other kinds of observation) and the liability to error from too much dependence upon the totals which, in the case of many species, cannot be expected even to approximate the actual number.

The determination of frequency indices for birds may have significance for local studies. In the first place it makes possible the arrangement of a series of species in order of their observed frequency of occurrence. It gives a more easily understood and more nearly correct impression of relative abundance than any other practicable method known to me. In addition, possibilities are offered for the analysis of the composition of a bird population and for comparison with populations of other localities and other regions.

The results of a study such as here suggested may furnish an indication, when interpreted on the basis of the behavior of the birds, of which species deserve emphasis in studies of environmental relations. It happens that species of most frequent occurrence nearly always require thorough study, but also species of infrequent occurrence cannot be ignored in an analysis of any avifauna.

Any attempt to obtain definite first-hand knowledge of the frequency of occurrence of birds is sure to clarify any worker's concept of a bird population and its make-up. Methods of the Raunkiaer type seem to have special value for their help in giving form to our notions of bird populations. The factors concerned at any given place appear to be numerous and uneven in their effects. Development of these methods will have an important effect upon the organization of projects for the regulation of animal numbers by artificial means. They help to demonstrate that conditions which influence populations are more complex than preliminary gross studies usually indicate.

Summary.—Because of the importance of, and the difficulties encountered in, studies of bird populations, it is suggested that attention be given to methods for expressing the relative frequency of occurrence of birds. Methods of the Raunkiaer type, commonly used in studies of vegetation, may be adapted to studies of occurrence of birds when allowance is made for certain conditions peculiar to bird populations. Daily records of birds observed in Yosemite Valley over an eleven year period provide the basis for the present analysis. The results are in agreement with those obtained in surveys of plants and of birds in other regions. Possible corollaries in general natural history are sketched.

Museum of Vertebrate Zoology, Berkeley, California, March 21, 1932.

FROM FIELD AND STUDY

The American Golden-eye in Arizona.—To judge from published reports the American Golden-eye (*Glaucionetta clangula americana*) is rare in Arizona. Swarth, in "A Distributional List of the Birds of Arizona" (Pacific Coast Avifauna No. 10, 1914, p. 13) cites only one record for the state, referring to a report published by J. L. Sloanaker in 1912, which records the taking of two specimens near Tucson, April 1 and February 1, respectively.

On several occasions during the past few years the occurrence of this species has come to my attention. In November, 1922, I shot a lone female on Salt River below Roosevelt Dam, but being unfamiliar with the status of Arizona birds the value of the record was not realized at that time. In the early fall of 1930, I was informed by Dr. Floyd M. Murphy of Flagstaff that he had seen the Golden-eye near that town, and a few weeks later, on November 11, he gave me the head of a female which he had shot that day at Ashurst Lake, about 25 miles south of Flagstaff. A drake traveling with this duck was also killed. I met with this species again on November 29, 1931, at Stewart Mountain Dam, on Salt River, north of Mesa, Arizona, where I examined several ducks just shot by Mr. James J. Lane. Among the lot was a female American Golden-eye. Mr. Lane gave me this specimen, which is now number 2662 in the collection of the Museum of Northern Arizona at Flagstaff. The skin has been recently examined by Mr. T. T. McCabe of the Museum of Vertebrate Zoology, Berkeley, California, and definitely identified as *Glaucionetta clangula americana*.

Swarth (*loc. cit.*, p. 90) lists this bird as of casual occurrence, but this additional information would seem to indicate a scarcity of qualified observers rather than a casual occurrence of the species, and, further, that the American Golden-eye may now be entitled to a place in the list of winter visitants to Arizona.—LYNDON L. HARGRAVE, *Museum of Northern Arizona, Flagstaff, June 15, 1932.*

Notes on the Nest-robber Tyrant in Costa Rica.—The Nest-robber Tyrant (*Legatus l. leucophaius*) was observed daily at El General, Costa Rica, during the month of April, 1932. Eggs were found after April 11. All eggs uncovered were placed in the pouched nests of two species of tyrants, *Myiozetetes g. granadensis* and *Myiozetetes s. columbianus*, although during this period several hundred nests with eggs, representing more than fifty species of birds, were located. All nests occupied by *Legatus* apparently were taken over as soon as construction was completed, as no eggs of *Myiozetetes* were found with those of *Legatus*. Just how change of ownership is effected was not solved. It may be remarked here that the genus *Myiozetetes* contains some of the most aggressive species of small birds inhabiting the American tropics. At El General, *M. granadensis* and *M. s. columbianus* were forever chasing hawks, and pestering toucans, parrots and lesser sized birds, including members of their own family, such as *Megarhynchus p. mexicanus* and *Tyrannus m. chloronotus*. By contrast, *Legatus* is a much more dispirited species and, of course, smaller in size.

The call notes of *Legatus* are high pitched and distinctive. Most individuals were located by hearing them, which led subsequently to the discovery of the nest, although the bulky nests of the species of *Myiozetetes* require no genius to find.

Eggs of *Legatus* are noticeably small for a species of its size. In color they are normally dark chocolate-brown, relieved by one or more pen-like, black, scrawled lines about the middle of the egg. The shell is thick, decidedly more so than in any other species of bird of similar size that I can recall. Also the albumen lining is exceedingly tenacious. Sets of one, two and three eggs were found incubated. In most, if not all, of the nests examined dried leaves were found in sufficient quantity to entirely cover the eggs.

On one occasion, I found two nests of *Myiozetetes granadensis* placed side by side on a tree limb; from one flushed *M. granadensis*; the other disclosed a brooding *Legatus leucophaius.*

Legatus broods rather closely, but when flushed it is less demonstrative than the species of *Myiozetetes*. Nevertheless, it generally remains in the immediate vicinity

when its nest is molested. *Legatus* has been recorded from Panama as entering nests of an Oropendola (*Zarhynchus wagleri*). This species is absent from the vicinity of El General.—AUSTIN SMITH, *San José, Costa Rica, June 10, 1932.*

Sanderlings and Turnstones at Salton Sea, California.—On a visit to Salton Sea, Imperial County, California, May 17, 1930, Sanderlings (*Crocethia alba*) were found to be fairly common on sandy beaches; one specimen was taken. On some small rocky islets in the sea, one Black Turnstone (*Arenaria melanocephala*) and four or five Ruddy Turnstones (*Arenaria interpres morinella*) were seen.—G. WILLETT, *Los Angeles Museum, Los Angeles, California, May 17, 1932.*

Nesting of the Black-chinned Hummingbird in Santa Clara County, California.—There appear to be but three records for the Black-chinned Hummingbird (*Archilochus alexandri*) for the Bay counties of west-central California (Grinnell and Wythe, Pacific Coast Avifauna No. 18, 1927, p. 94) and no record at all of its nesting in that region. Some twenty years ago the writer gave about one hundred sets of locally taken eggs to a young friend. After being packed away for nearly that length of time they were recently returned. Among them were three sets with nests of the Black-chinned Hummingbird. One set was still in perfect condition but unfortunately the other two were broken.

Set number 1 was taken on May 5, 1907. The nest was placed eight feet up on the end of a sycamore limb and contained two fresh eggs. Nest number 2 was taken on May 12, 1907, and was placed about fifteen feet up in a small white oak; two fresh eggs. Nest number 3 was taken May 14, 1907, and was only two feet up on the tip of a low-hanging sycamore limb. It held two fresh eggs. These sets were taken by the writer about four miles west of Gilroy.

The nests are all typical of this species and are composed entirely of down taken from the underside of sycamore leaves, and cobwebs. One pair of birds was under close observation during nest building and the female apparently gleaned most of the material from dried leaves which were frozen earlier in the spring. It would be interesting to know if this bird ever uses any other down in the construction of these sponge-like nests. This may not be the northern breeding limit of this bird along our coast. A search should be made along the sycamore-bordered streams of northern Santa Clara and Alameda counties. Male birds were noted July 15, 1926, and April 1, 1928, at the writer's home, feeding among potted plants on the porch.—W. E. UNGLISH, *Gilroy, California, May 16, 1932.*

Titmouse Menu.—In the course of the several years during which food of various kinds has been offered to birds in my back yard on the Tunnel Road in Berkeley, I have never seen a Titmouse come to eat until recently. These birds are mainly insect eaters and it was quite surprising to discover one taking bread and eating it. This I have witnessed daily for the last week.

Yesterday a Plain Titmouse (*Baeolophus inornatus inornatus*) picked up a piece of bread too large to carry away, but managed to carry it to a clothes line and there feed from the bread exactly as a jay would. The bread was held on the line with the feet and particles broken loose by repeated pecking and then eaten. When the meal was finished, the bird released the bread, which immediately fell to the ground, and departed, leaving no doubt as to the bread being held by the bird's feet.—CLAUDE GIGNOUX, *Berkeley, California, May 23, 1932.*

Notes on the Western Burrowing Owl.—While digging out a few nests of the Western Burrowing Owl (*Speotyto cunicularia hypugaea*) which were in excavations of Douglas Ground Squirrels (*Citellus douglasii*) near Benicia, Solano County, California, on April 23, 1932, with Henry W. Carriger, we found several examples of the food of these birds other than the usual segments of Jerusalem crickets (*Stenopelmatus*), ground beetles, and such.

From one of the cavities, before the eggs were reached, Carriger withdrew three Pacific Coast Newts (*Triturus torosus*), the heads missing from each of these salamanders.

From another hole, while we were following by means of pick and hoe the carpet of horse manure, I removed a Pacific Pallid Bat (*Antrozous pallidus pacificus*) with a wing spread of about fifteen inches. This, too, had been considerably "chewed upon."

In still another cavity was the rear half of a freshly-killed Least Sandpiper (*Pisobia minutilla*). Large flocks of these little "peeps" had been noted on the previous day flying over and feeding on the mud flats a quarter of a mile away. There was a question in our minds whether a burrowing owl could outfly and capture on the wing one of these sandpipers. In this connection I found that the food in the stomach of the sandpiper had been digested, there remaining in the stomach only thirty grains of sand and a hard-cased seed of similar size. From this it might be inferred that the sandpiper was taken by the owl during the night or early in the morning while the former was at roost. If taken at such a time the food would normally have become digested.

Another rather interesting note in connection with this day's collecting was the fact that one of the females captured in the nest cavity had evidence of holding another egg. She was taken to my home, placed in a box, and the egg was laid for us the next morning, quite likely completing the set of seven. The bird was then returned to the nesting locality and released.

I got another thrill when I found that an owl caught on her eggs in one of the holes bore a band which I had placed on her two seasons before, as I had captured her under similar circumstances in this identical field on May 6, 1930.—EMERSON A. STONER, *Benicia, California, May 24, 1932.*

Bird Notes from Southern California.—Perusal of a few recent volumes of the Condor has brought my attention to facts regarding the occurrence of a few species of birds from southern California. A few statements from my notes on three species may, in the light of these, be of interest and are presented here.

Red-breasted Merganser (*Mergus serrator*). This bird is rare in the region during the summer months. Mr. J. Moffitt (Condor, 33, 1931, p. 252) has published a record of four immature birds seen at the Bolsa Chica Gun Club, Orange County, on June 9, 1931. While at Palisades del Rey, Los Angeles County, on June 25, 1929, I discovered three birds, all apparently immature, in the canal east of the colony of beach homes. The birds were noticed again July 2 off-shore in company with some White-winged Scoters.

Wilson Phalarope (*Steganopus tricolor*). This species is none too common in southern California in spring and there are few coastal records. I saw a small flock of these birds in the salt marsh owned by the local gun club at Palisades del Rey on April 13, 1929. All the birds were in breeding plumage. Two specimens were collected.

Vermilion Flycatcher (*Pyrocephalus rubinus mexicanus*). Mr. W. C. Hanna has brought up the subject concerning the most westerly breeding station of this species in California (Condor, 31, 1929, p. 75). On April 15, 1928, he found a nest with eggs at Coachella, Riverside County. There are several specimens of this species, taken in March and April at Mecca, which are now in the Museum of Vertebrate Zoology at Berkeley. One female was collected by W. P. Taylor at Torres (now Toro), seven miles south and slightly west of Coachella. This bird (no. 828, Mus. Vert. Zool.) was taken April 15, 1908, with these notes of the collector: "The Vermilion Flycatcher contained well-developed eggs, so probably the species breeds here." While collecting at Indian Wells on May 11, 1930, I discovered a family of flycatchers in a grove of Fremont cottonwoods along the Palm Springs-Mecca auto road. Two immature birds were being fed by both adults. This locality is eight miles west of Coachella and extends the breeding range of this bird slightly still farther to the westward. The male was collected.—JAMES STEVENSON, *Berkeley, California, March 28, 1932.*

Bohemian Waxwings in Colorado, 1931-32.—Bohemian Waxwings (*Bombycilla garrula*) were present in Colorado over a large area of the State, and in incredible numbers, from October to April (1931-32); there seems no way to estimate, even approximately, the numbers of these birds in Colorado during those months, but it was of the order of hundreds of thousands.

So far as I am able to ascertain, through reports sent to me by obliging friends residing in widely separated Colorado areas, the species came into Colorado by the

way of Fort Morgan early in October (the 3rd), where and when Mr. Edw. Hellstern saw a flock of moderate size on his home grounds. Singularly enough the second appearance of this species in our State during the winter of 1931-32 was at Mrs. Anna Benson's home in Fruita, where the birds arrived on December 14, appearing and disappearing at irregular intervals until March 22.

Evidently this winter's flood of Bohemian Waxwings divided into two streams as it made its way southward along the Rockies, one keeping to the eastern slope (via Fort Morgan), and the other to the western side of the mountains (via Fruita).

The last date of the presence of this waxwing in Colorado in the spring of 1932, is April 21, when a lone individual was seen by Mr. F. G. Bonfils near his house grounds. The earliest date of this season's invasion of Denver is January 19, when a flock was noted by Miss Irene Fowler in the northwest section of the city.

The birds became after that date unbelievably abundant all over the city, wandering about in search of food, which was provided for them by many citizens. On one occasion every tree on the Bonfils estate was actually dark with waxwings. They congregated in this yard because there they found an abundance of food, generous supplies of things that the birds relished having been spread about the premises. On this particular day the flock consumed more than nine pounds of raisins.

These winter visitors were recorded at the following Colorado localities: Colorado Springs (E. R. Warren), Denver (many observers), Englewood (Mrs. Enid Ortman), Fort Morgan (Edw. Hellstern), Fruita (Mrs. Anna Benson), Ione (Mrs. T. C. Forward), Littleton (Mrs. R. J. Kerruish), Loveland (Mrs. John Weldon), North Park (Mr. and Mrs. Geo. J. Bailey), and on the William's Fork of the Yampa River (Edw. Hellstern).

Mr. and Mrs. Bailey write that they never saw this species in their neighborhood (North Park) until a pair stayed there from the 5th to the 22nd of this past March. This absence of Bohemian Waxwings about the North Park area is explained by the Baileys by the absence of timber and suitable food in the Park.

These birds were last noted at Fort Morgan on February 3; Englewood, March 7; Loveland, March 20; Littleton, March 23; and Denver, April 21.

For a few days immediately prior to March 12, Denver experienced a spell of sub-zero weather which, however, seemed in no way to affect the waxwings. Only one report of the finding of dead waxwings has reached me this season, due, not to the cold spell, but probably to overeating, as these dead birds were found on the Bonfils estate, where the birds were happily gorged all the time. The species seemed to be held to a given area by the food available. Thus at Ione there were but a few waxwings all this past fall and winter, and these few tarried but a day or two. Mrs. Forward feels sure that this brief visit was due to there having been no hanging or windfall apples in the Ione orchards, the apple crop there having been a failure in 1931.

When Mr. Hellstern studied these waxwings last fall while hunting big game in northwestern Colorado, he was surprised to see them act as flycatchers.

Groups of waxwings varied in size, as they did in 1917, from a pair to a thousand or more. This season's birds were very tame, more so than in previous visits. While being fed at Mr. Bonfils' home they crowded about the food donor, alighting on his head, shoulders, arms, hands and the food container. They would take a raisin from the donor's lips. Any dried fruit or berry was acceptable, raisins, currants, apples, and Russian olives; when these failed they would take bread crumbs or meat scraps.

All of my friends are agreed that this waxwing is most amiable in its comportment when in flocks, never becoming quarrelsome or piggish over a food supply as do most other birds.—W. H. BERGTOLD, *Denver, Colorado, June 9, 1932.*

The Approximate Louse Population of a Burrowing Owl.—Driving by a freshly-killed Western Burrowing Owl (*Speotyto cunicularia hypugaea*) on the side of the paved highway near Benicia, Solano County, California, on March 21, 1932, I stopped, picked it up, and placed it in my car with the intention of looking into the stomach contents in order to find what the bird had been feeding upon.

Upon examining it that evening I became immediately aware, as one often does when handling birds, of a number of lice crawling on my hands. Scraping them off

into a near-by glass, it occurred to me to try to ascertain how many more there might be. I had placed the bird on a newspaper and noted that none of the lice would leave its host via newspaper but readily transferred to my hand. Therefore it seemed unlikely that few, if any, would have left via highway or the rubber-covered floor of my car. The bird now being cold, all of the parasites appeared to be in the feathers instead of on the body, the majority continually appearing exteriorly on the feathers about the neck and head. What seemed at first to be nearly a hundred proved to be approximately fifty-five individuals, counting one or two which escaped up my sleeve and proceeded to annoy me after I had dressed in the same clothing the next morning. I searched for over an hour in making this count in an effort to make my census as complete as possible, and I believe that few escaped my attention.

A few of the specimens were sent to the United States Bureau of Entomology and were identified as the Biting Owl Louse (*Philopterus syrnii* Packard).

Incidentally, the Burrowing Owl had fed upon Jerusalem Crickets (*Stenopelmatus*), a favorite food with hawks and owls here, five of these large insects being represented by the segments and parts which were in the stomach.—EMERSON A. STONER, *Benicia, California, May 25, 1932.*

Snowy Egret at Monterey, California.—On May 19, 1932, near the lighthouse at Pacific Grove, California, a Snowy Egret (*Egretta thula brewsteri*) was observed under such favorable conditions that, although sight records are usually not considered reliable, I feel it worth recording. Between the lighthouse and the ocean there is a small pond, with a building near-by. We noticed a white object on the far side of the pond, which upon closer investigation proved to be a bird. Soon it began moving about, and presently passed within a few feet of a resting Black-crowned Night Heron, which gave us an excellent chance to judge of size. We walked around toward our bird, and were able to get very close to it. When it finally flew its yellow feet and black legs formed a startling contrast.

The black bill was plainly seen. The bird lit some distance away, but with the 8x glasses which we were using we could still see the black legs and bill. We again walked toward the bird, but when we were still some distance from it, it flew again and finally disappeared over the bay. I have never had a better chance to observe any bird than I had with this one. Every possible point was checked with the aid of Hoffmann's "Birds of the Pacific States", which I had with me at the time, and later with colored illustrations in other books. The black legs and yellow feet of this bird, found together in no other heron in the United States, were plainly visible to the naked eye when the bird first flew, and for some considerable distance with the glasses.—CLARENCE F. SMITH, *San Francisco, California, June 24, 1932.*

An United States Record of the Timberline Sparrow.—On October 13, 1931, at an altitude of 4000 feet, one-half mile southwest of Escondida, Otero County, New Mexico, Mr. Seth B. Benson shot a specimen of *Spizella breweri taverneri* which gives important indication of the course of migration of this subspecies far to the southward of its restricted breeding ground in northwestern British Columbia. The bird, a female, apparently adult and in complete winter plumage, was prepared by Miss Louise Kellogg (her field number 1201) and by gift from her and Miss Annie M. Alexander is now number 59014 in the California Museum of Vertebrate Zoology. The collector recognized this bird before it was shot, as differing from the Brewer Sparrows (*Spizella breweri breweri*) which were common at the same time and place.

In every single character ascribed to *taverneri* by the original describers (Swarth and Brooks, Condor, XXVII, 1925, pp. 67-69) the specimen here recorded is in perfect agreement. I have also compared it with the topotype series. Briefly and especially, it stands out from *breweri* by reason of its small, blackish bill, darker colored feet, broader black streaking on upper surface, generally grayer, less clay-color or buffy toned ground-color both above and below, and, notably, by reason of the decided indication of shaft-streaking on the chest and sides.

In the *Auk* (XLV, 1928, pp. 509-510) Mr. Ludlow Griscom published a note concerning "*Spizella taverneri* on Migration in Montana." Since this was the first ascription of this form to the United States, my curiosity to see the specimen upon which it was based led me at once to ask for the loan of it. This, Mr. Griscom kindly saw

to in 1928, and just now (June, 1932) I have again been accorded the privilege of examining it.

This specimen is now no. 237986 in the Museum of Comparative Zoology, Cambridge. It was collected by Mr. Griscom himself, on September 14, 1927, near Cameron in Madison County, Montana, where it was one of a small company which had been seen almost daily since the 4th of September in a growth of rose bushes and willows within, I judge from the account, the Transition life-zone not far from the nearest tongue of Canadian.

After repeated comparisons of this bird with considerable series of *Spizella* of wide geographic representation in western North America, I conclude, first, that it is not an "immature" but an adult in the sense of being more than one year old. This is shown by the un-sheathing remiges. I would thus be inclined to think that all the birds Griscom saw, September 4 to 16, were still on or very near to their breeding grounds. Then, as to subspecies it is certainly not good *taverneri* but, rather, essentially *breweri* in the features of the population occurring in northern parts of the United States. An almost duplicate of Griscom's bird is no. 228731, Biol. Surv. coll., U. S. Nat. Mus., an adult female taken by Alex Wetmore near Moran, Wyoming, September 3, 1910. These northern birds as compared with *breweri* from typical sage-brush territory (Nevada and eastern and southern California) do show certain minor tendencies toward *taverneri*, but they do not show the complete combination of characters shown by the New Mexico bird.

An interpretation here offered is that these northern United States birds are in the nature of intergrades toward *taverneri*, though in relatively slight degree. This idea has been expressed elsewhere concerning a breeding specimen from the high Transition or low Canadian life-zone close to Lassen Peak in northern California (see Grinnell, Dixon and Linsdale, Univ. Calif. Publ. Zool., vol. 35, 1930, p. 427). More "typical", that is, southern *breweri* over vast areas is associated in the breeding season with the sage-brush (*Artemisia tridentata*). At least two of the aberrant birds were recorded as from a quite different habitat—which may be of some significance.

The type locality of *Spizella breweri* Cassin is probably now satisfactorily established as the Black Hills, South Dakota (see Stone, Proc. Acad. Nat. Sci. Phila., 1899, p. 30, and Grinnell, Univ. Calif. Publ. Zool., 38, 1932, p. 323). Hence that name would apply, on geographic grounds, to an intergradient population. I have tried out the idea suggesting itself that three races of *S. breweri* might be recognizable—(1) *taverneri* proper, (2) a northern United States race to which the name *breweri* might be restricted subspecifically, and (3) an unnamed southwestern race, slightly smaller, paler and more narrowly streaked above than the middle one, on an average of characters. But, as intimated above, I do not now find good ground for any such action. A best course would appear to be to consider all breeding birds up at least to the Canadian boundary as *S. b. breweri*, though in some specimens showing appreciable tendencies toward the extreme northern racial manifestation of the species, *S. b. taverneri*.

To return to the New Mexico bird, it, then, is typical *taverneri* without any doubt at all, and indicates a point far south along the migration route of that race, possibly terminal and hence a wintering station. Reference to Mrs. Bailey's "Birds of New Mexico" (1928, p. 748) reveals that some "Brewer Sparrows" (which might include this form) remain within that State through the winter, though apparently the great majority move farther south.—J. GRINNELL, *Museum of Vertebrate Zoology, University of California, Berkeley, June 26, 1932.*

EDITORIAL NOTES AND NEWS

An article of extraordinary interest to students of bird behavior appeared in the June issue of the *Wilson Bulletin* (vol. XLIV, 1932, pp. 65-75) under the title "Winter Starling Roosts of Washington." The author, Mr. E. R. Kalmbach, therein describes most vividly the way in which the introduced European Starlings congregate at night for roosting in certain places within the city of Washington, D. C. Among other traits, remarkable ability and tenacity is shown by these birds individually, to return night after night to particular roosting spots within the general locus of the aggregation, and to space out, each bird in its own position on a given perch. What seems to be vast confusion resolves itself finally into a degree

of orderliness which Mr. Kalmbach aptly likens to "what one sees at any football game when each of 50,000 or more spectators" has at last planted "himself in his own reserved seat before the start of the game."—J.G.

The two-volume work by Dr. Thomas S. Roberts on "The Birds of Minnesota" is out and will probably stand as the most noteworthy single American publication in the ornithological field during the year 1932. It has been long expected; indeed any comprehensive undertaking of the sort must require a period of years for its completion, even under the best of circumstances. That Dr. Roberts' life-time of labor has been unremitting and to good purpose is abundantly demonstrated by the high standards shown in the volumes in question, as to quality and quantity of text, as to the abundance and excellence of the illustrations (which include 92 colored plates by Brooks, Sutton, Weber, Jaques, and Breckenridge), and as to the high grade of bookmaking throughout. In the latter regard, the auspices of publication (The University of Minnesota Press, Minneapolis) deserve sincere commendation. The two volumes are of demy quarto size and comprise together some 1250 text pages. While costing many thousands of dollars to publish, friends of ornithology and of Dr. Roberts have defrayed most of this cost, so that the set can be purchased in stout, cloth binding (from the University of Minnesota Press) for $6.00. There is also a de luxe edition at $25.00.—J.G.

A well gotten up list of the "Birds of the Battle River Region [of central Alberta] With Notes on their Present Status, Migrations, Food Habits and Economic Value" has just appeared (July, 1932) under the authorship of our fellow Club member, Mr. Frank L. Farley, who is so well known for his successful activities in the bird-banding field. This 85-page booklet may be had for fifty cents from its publishers, The Institute of Applied Art, Limited, Edmonton, Alberta. It is rather surprising to us to find that no less than 238 species and subspecies have been found in this far northern district of relatively limited extent. Mr. Farley includes in this contribution a most interesting chapter on "Tracing the Gulls to their Winter Homes," based on the results of some of his banding operations near his home at Camrose, Alberta.—J.G.

MINUTES OF COOPER CLUB MEETINGS

NORTHERN DIVISION

MAY.—The May meeting of the Northern Division of the Cooper Ornithological Club was held on June 23, 1932, at 8:00 p. m., in Room 2003, Life Sciences Building, Berkeley, with forty-two members and guests present. In the absence of the regular officers Mr. Joseph Grinnell presided. Minutes of the Northern Division for April were read, corrected and approved.

"Current observations from the field" was the topic of the evening's program. So interesting and varied were the contributions offered and the discussions evoked that when the Chairman closed the meeting at 9:30 only half of the people present had had an opportunity to report. Many members lingered to inspect a caged Harris Sparrow, captured by Mr. E. L. Sumner, Sr., in a banding trap in Strawberry Canyon on May 3, the eighth record for the State. Mr. W. O. Emerson, who was present, secured the first known specimen at his home in Hayward in 1900.

The Phainopepla was reported by Mrs. J. R. Davis as being present this year in small numbers in a cañon southwest of Livermore, where three or four pairs were seen on May 1. A pair of these birds in Hospital Cañon south of Corral Hollow was reported by Mr. E. I. Dyer and Mr. W. F. Sampson as seen on April 17.

The Barn Owl was reported upon by Cranson Hopkins as using nesting boxes put up by himself in suitable places where natural nesting cavities were absent. Comment on the Russet-backed Thrush reminded Mrs. Lindsey of the apt description of the song as "spiral".

The marauding habits of the California Jay were illustrated by Dr. L. W. Taylor's report of the killing of chicks at the poultry farm in Strawberry Cañon by birds of this species; by Mr. Mailliard's report of the beheading of a canary, whose cage was hung outside a window at Belvedere; and by the discovery by Miss Erickson on three different days of jays carrying off very young brush rabbits. Miss Erickson also told of exchanging young California Jays between two nests and of the uninterrupted rearing of the exchanged young by the apparently unwitting adults.

Mr. Sumner told of banding a Golden-crowned Sparrow on April 18 which made 29 repeats before its departure on May 11.

Many activities of the numerous birds about his Piedmont home were described by Mr. Dyer, whose discovery of a brood of twenty young California Quail leaving the nest at 6:30 p. m. on May 25 makes the first reported Bay region record for this year. Other interesting observations on the Quail were made by Lowell Sumner, Jr., just returned from studying these birds in an area in San Mateo County enclosed in such a way that the birds are living under very nearly natural conditions. A discussion of these birds led to a comparison with the nearly related Bobwhite of the Eastern states, whose habits were described by Mr. Tonkin, Mr. Pursell, and Mr. Mikesell. The last named had known the birds in eastern Washington State as well, where their introduction was a pitiful failure because of the bird's total unfitness to cope with the soft winter snows of that region.

The first nesting record of the Red-breasted Nuthatch for the Bay Counties was announced by Mr. Cain, who on May 15 banded four young just ready to leave the nest. These birds were reared in a bird box put up two years ago at the Oakland Scout Camp at Diamond Cañon, where Mr. Cain has often noted the species in fall and winter. Part of the rim of the nest hole was marked with pitch, in the manner characteristic of this bird when nesting in natural cavities.

Adjourned.—HILDA W. GRINNELL, *Secretary.*

JUNE.—The regular monthly meeting of the Northern Division of the Cooper Ornithological Club was held on Thursday, June 23, 1932, at 8:00 p. m., in Room 2003, Life Sciences Building, University of California, Berkeley. President Linsdale occupied the Chair and thirty-five members and guests were present. Minutes of the Northern Division for May were read and approved. Minutes of the Southern Division were read. The name of Mr. Carl Olsen, 11 East Gabilan Street, Salinas, California, was proposed for membership by Mr. W. C. Jacobsen.

President Linsdale announced the appointment of Mr. Mailliard, Mr. Storer and Mr. Grinnell, Chairman, as a committee to draw up resolutions on the death of Dr. C. W. Richmond, honorary member of the Club. In accordance with the expressed wishes of the Southern Division he instructed the Committee to act for both Divisions. The resolutions subsequently drawn up were as follows:

Whereas, in the death, on May 19, 1932, of Charles Wallace Richmond, for thirty-eight years in curatorial service in the Division of Birds, United States National Museum, ornithology has lost an eminent scholar—one who has contributed importantly directly or indirectly to publication in this field; and

Whereas, we of the Cooper Ornithological Club, in which organization Dr. Richmond was an Honorary Member, have had occasion, many of us, to know of his constant readiness to help others in their studies, and also to become individually aware of his genial and stimulating personality; therefore be it

Resolved, that we of the Cooper Ornithological Club hereby express our deep sorrow at this loss to ornithology as a science and to students of birds both within our Club and elsewhere; and be it further

Resolved, that a copy of these resolutions, with an expression of our sincere sympathy, be sent officially from the Club to Mrs. Richmond.

The Chair then called attention to the recommendation of the special committee on nominations for honorary memberships in the Club, this committee having presented the names of Mr. A. W. Anthony of San Diego, and Mr. Albert M. Ingersoll, also of San Diego. Following the usual course these nominations will be ratified at the July meeting of the Northern Division.

Mr. Dexter reported having seen a Black-crowned Night Heron and an American Bittern at Lake Temescal on May 8, and a Kingfisher and nesting Black Phoebe at the same place on May 15. Mr. Bunker saw a flock of Cedar Wâxwings on May 20. Mr. W. F. Sampson reported by letter that on the morning of June 11 he noticed a female Western Evening Grosbeak on top of the aviary of Dr. Hugh Fraser of Piedmont. Among the birds confined in the aviary were two male Western Evening Grosbeaks. Mr. H. Robert Poultney told of the taking of a Bronzed Grackle in southeastern Nevada and Mr. E. R. Hall of securing a Yellow-throated Vireo in the same region.

Prof. Loye Miller of the Southern Division being present, the Chairman asked him to tell of his trip through the Santa Barbara Channel on May 14. Dr. Miller then told of noting an adult Sabine Gull in breeding plumage, his first spring record for the species in those waters. A wave of migrating warblers was encountered, including Audubon and Black-throated Gray Warblers, a female of the last named species coming aboard the boat and remaining for some time. On the eastern end of Anacapa Island a lighthouse had been erected since Dr. Miller's last visit and he found that the Western Gulls,

Farallon Cormorants and Pelicans which formerly nested there had been driven away by a pack of terriers and also as the result of shooting by persons on the lighthouse reservation. On the smaller, separated, western end of the island, protected from these depredations by a channel, available nesting sites were being occupied.

The evening's talk was given by Mr. Leo K. Wilson, Chief of the Bureau of Education and Research, California Division of Fish and Game, on "The Waterfowl Situation." Mr. Wilson marshalled before his hearers a comprehensive array of facts accounting for the lessening numbers of our waterfowl and remedies suggested. However, he could offer but slight hope for the restoration of their numbers. It was good to learn, though, that at the recent conference in Salt Lake, delegates from British Columbia told the speaker that conditions in the breeding areas of the prairie provinces this year are excellent, in marked contrast with the drought of last season.

Adjourned.—HILDA W. GRINNELL, *Secretary.*

SOUTHERN DIVISION

MAY.—The May meeting of the Southern Division of the Cooper Ornithological Club was held on Tuesday, May 31, 1932, at 8 p. m., in the Los Angeles Museum, Exposition Park, Los Angeles, with President Michener in the Chair and about 35 members and guests present. Minutes of the Southern Division were read and approved. Minutes of the Northern Division were read. Proposals of new names for membership were: Howard P. Davis, 2608 W. Ramona Blvd., Alhambra, Calif., by W. Lee Chambers; S. W. Holmers, 5296 E. 2nd St., Long Beach, Calif., by W. Lee Chambers; Allen W. Mains, Box 43, Calexico, Calif., by W. Lee Chambers; Arnold L. Nelson, U. S. Biological Survey, Food Habits Research, Washington, D. C., by Francis Uhler; Dr. S. Charles Kendeigh, Biology Dept., Western Reserve University, Cleveland, Ohio, by S. Prentiss Baldwin; Dr. Robert M. Campbell, 746 S. Hobart Blvd., Los Angeles, Calif., by G. Willett.

A letter was read requesting the appointment of two representatives to serve in behalf of the Southern Division of the Cooper Club at the next meeting of the Affiliations Committee, Pacific Division of the A. A. A. S., to be held in the auditorium of Bryan Hall, June 16, at Pullman, Washington. It was moved and seconded that the matter of representation be left to the Northern Division with the request that their appointees act for the Southern Division also. Motion passed. It was moved and seconded that the Secretary be instructed to communicate with the Northern Division notifying them of this request. Motion carried.

It was moved and seconded that the Secretary be instructed to communicate with the Northern Division relative to the possibility of that body formulating resolutions in connection with the death of Dr. Richmond. Motion amended to read: That the Secretary be instructed to communicate with the Northern Division relative to the possibility of that body formulating resolutions in connection with the death of Dr. Richmond; if any such action has been taken, the Secretary of the Southern Division be instructed to indorse the resolution. Motion as amended, passed.

The special committee on Nominations for Honorary Membership in the Cooper Ornithological Club presented the following recommendations.

"We, the undersigned members of the Cooper Ornithological Club, propose for Honorary Membership in the Club Mr. Alfred W. Anthony, 3947 Center St., San Diego, California. Mr. Anthony was one of the first collectors to work extensively along the coast of Lower California and on its numerous islands. His tremendous activity has enriched our knowledge of bird life and clearly entitles him to a place on our Honorary Membership List. Signed, G. Willett, W. Lee Chambers, Howard Robertson, Loye Miller, J. R. Pemberton.

"We, the undersigned members of the Cooper Ornithological Club, propose for Honorary Membership in the Club Mr. Albert M. Ingersoll, 908 F Street, San Diego, California. Mr. Ingersoll's work as an ornithologist, especially in the oological line, has been unique. Mr. Ingersoll has assembled a wonderful collection of birds' eggs with complete data, all of his own collecting. All these, as far as possible, are beautifully prepared with nests *in situ*. Ornithology throughout the world has been directly benefited by his careful work and we are very glad to propose Mr. Ingersoll for addition to our list of Honorary Members. Signed, G. Willett, Howard Robertson, W. Lee Chambers, Loye Miller, J. R. Pemberton."

Both names were passed, separately, by an unanimous vote.

Preceding the discussion of the evening's topic, Mr. Michener turned the meeting over to Mr. Howard Robertson who led a discussion on the history of the Cooper Club, tracing its development step by step from a loosely organized group of kindred spirits to its present form. Among those contributing historical data were the following members: W. Lee Chambers, J. R. Pemberton, George Willett and Otto Zahn. Mr. Miller described the formation of the Board of Governors, explaining its function and describing its present composition,

showing that it is a self-perpetuating body, growing with the growth of the organization and being controlled by the Club at large through their election of the yearly office holders and the presence at meetings, as ex officio members, of the active secretaries.

Adjourned.—RAYMOND B. COWLES, *Secretary.*

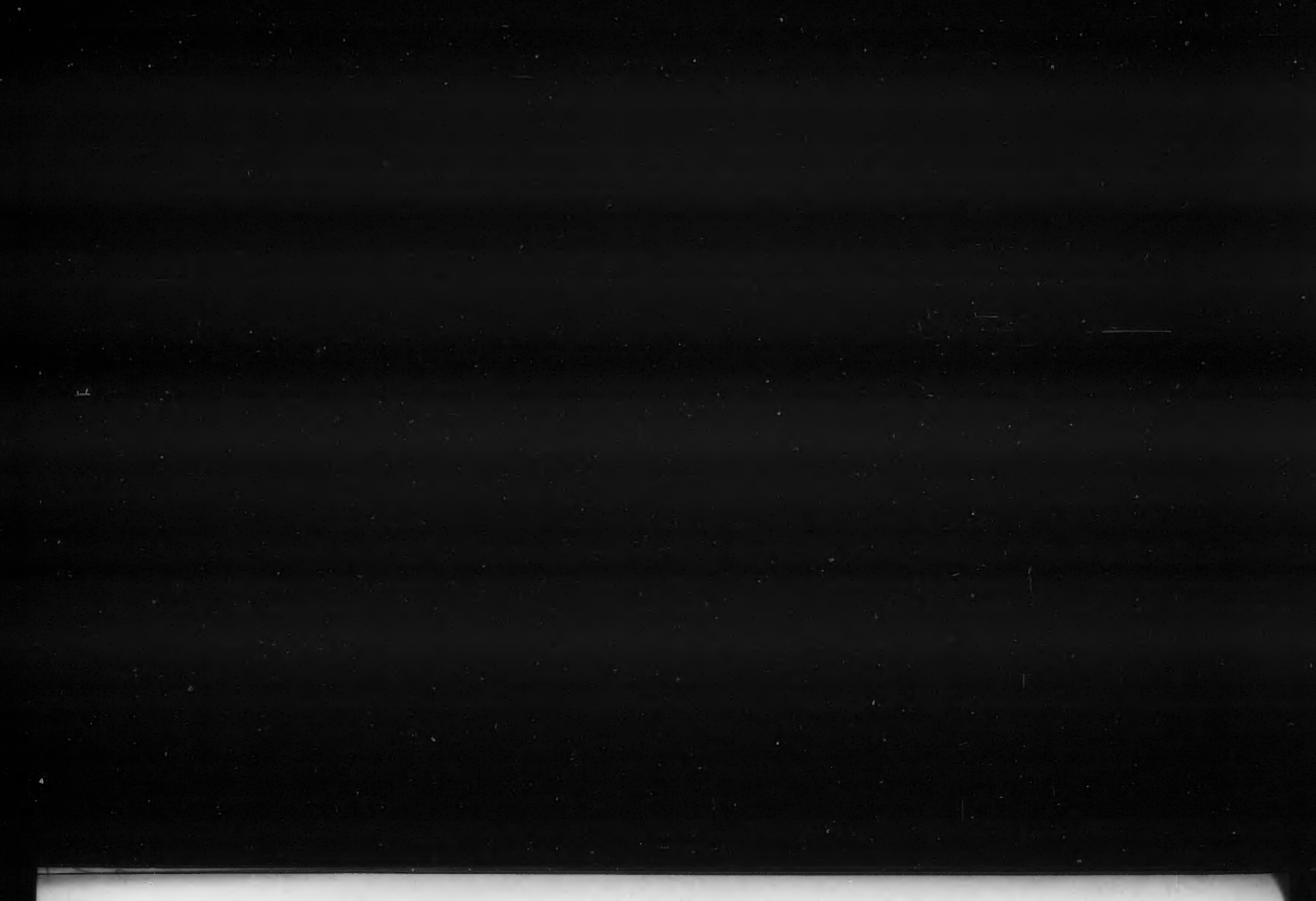
JUNE.—The June meeting of the Southern Division of the Cooper Ornithological Club was held Tuesday, June 28, 1932, at 8 p. m., in the Los Angeles Museum, Exposition Park, Los Angeles, with President Michener in the Chair and about twenty members and guests present. Minutes of the Southern Division were read and approved. Minutes of the Northern Division were read. Mr. Harry Spang, 1640 Corning St., Los Angeles, Calif., was proposed for membership by W. Lee Chambers.

It was suggested that a standing committee be appointed to review recent publications in ornithology. Mr. John McB. Robertson suggested that the task would be almost impossible of accomplishment owing to the great quantity of material and the diversity of its sources. Mr. John McB. Robertson called attention to the publication of Bent's "Life Histories of North American Gallinaceous Birds". A suggestion was made relative to the vacating of one or more of the summer meetings. Mr. Howard Robertson moved that the meetings be held regularly during the summer. Motion seconded and passed.

Mr. Willett reported that a well known conservation league had invited both him and Mr. Wright Pierce to attend one of their meetings which was to be devoted to a discussion of poisoning campaigns. During the first meeting expressions were unanimously opposed to the methods now employed. At a second meeting, representatives of State and County departments of agriculture were present and expressed their views, naturally favoring the campaigns. The league voiced opposition to the methods now in vogue and suggested that poison be placed in the burrows as a substitute for exposed bait. In reply it was stated that poison in such places was entirely useless as animals would not feed on it when so placed. Messrs. Willett and Pierce have agreed to experiment with bait used in burrows and are now in search of a suitable terrain. Mention was made of the apparent fact that a few grains of the bait placed in the burrow worked in a satisfactory manner, whereas a handful of the seed failed to show the same results. Mr. John McB. Robertson reported having had almost invariable success with poison placed in burrows and stated that for a long time it was the only method used.

Mr. John McB. Robertson displayed a series of maps published by the "More Game Birds in America Inc." foundation, based on temperature records. The foundation's conclusion as drawn from a study of these maps recommends a change in the open season on ducks. The opinions of members of the Cooper Club are illustrated by the following quotations. "Merely a new scheme devised for insuring a 90 day open season on ducks." "Offers the rich sportsman opportunities to follow the ducks from north to south and increase the slaughter." "No value in the suggestion." "The maps are a splendid piece of work and could be used for other purposes."

Mr. Don Meadows reported his observations on the avifauna of Santa Catalina Island and presented many exceedingly interesting facts. It was suggested that this material be published as a paper rather than in the minutes. Mr. Willett led a discussion on the status of the species of doves introduced into California, and Mrs. Law reported a decrease in the number of quail near her home in Altadena and noted that there had been an increase in the number of skunks and opossums in the vicinity.

The proposed Duck Stamp Law was described by Mr. W. Lee Chambers. The stamps are to cost one dollar and may be purchased at the nearest Post Office. Eighty-five cents of the dollar are to be used for propagation and the remaining fifteen cents are to be used for law enforcement. Since this law taxes only the duck hunter it has been approved by many hunters' organizations. Mr. Willett stated as his opinion that unless there were a four or five year closed season on ducks, those buying the stamps would soon find it impossible to obtain enough ducks to cover the stamp. Mr. Chambers reported a 33 1/3% reduction in ammunition sales in 1931 and intimated that there might be a similar decrease for 1932. It was also suggested that sufficient breeding ground territory might be almost as essential for the preservation of ducks as regulations of the shooting. Alarm was expressed over the rapid reduction in the size of present, remaining breeding areas.

Adjourned.—R. B. COWLES, *Secretary.*